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TruTouch – a new possibility for quick modification of alcohol behavior in the workplace

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Drug Rapid Tests
Medical Rapid Tests
Laboratory Diagnostics
Laboratory Service
Consulting & Service

Overview

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Simulated Case

Hypothetical Case: 1,000,000 Habitual drinkers

- Each comes to work with alcohol above the defined limit on average once every two weeks

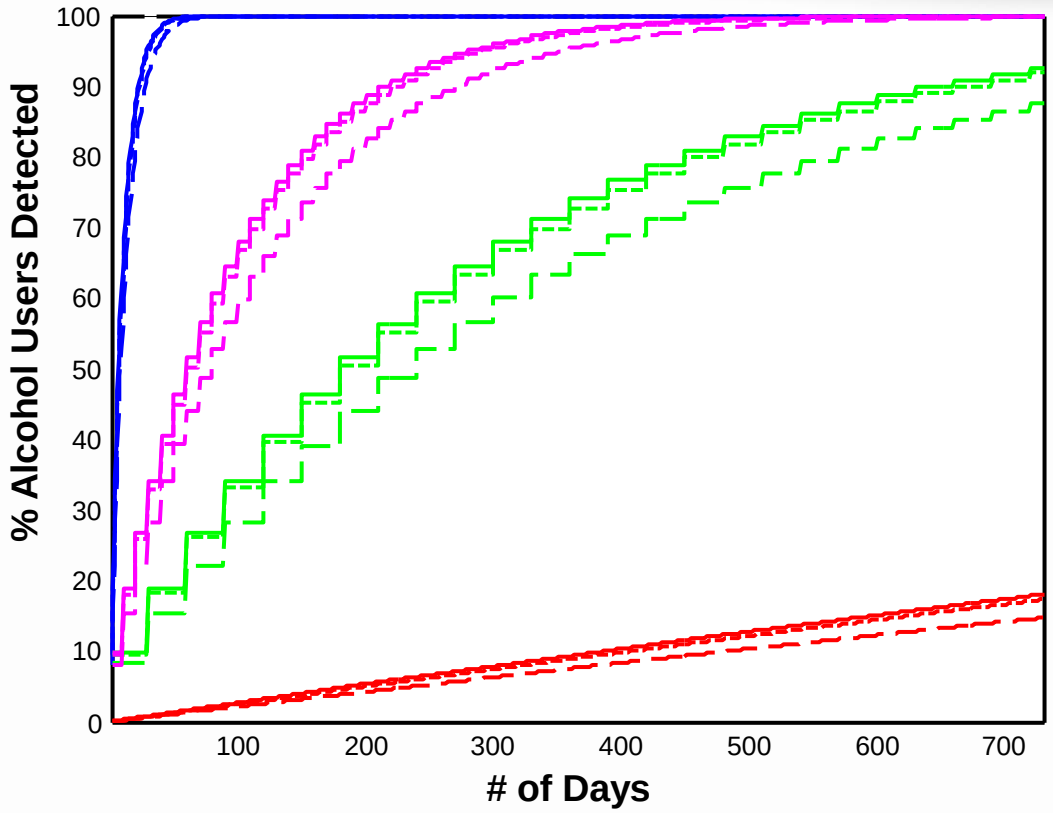
How long does it take to detect the habitual drinkers for the following approaches:

- Random, once per year testing
- Monthly testing of all employees
- 10% of the employee population daily, randomly selected
- Daily Testing of All Employees

Examine each case using hypothetical devices with False Negative Rates (FNR) of 1%, 5%, and 20%

- FNR is the % of times someone above the limit is passed by the device

Effectiveness of Detection



- Daily (1% FNR)
- Daily (5% FNR)
- Daily (20% FNR)
- Monthly (1% FNR)
- Monthly (5% FNR)
- Monthly (20% FNR)
- 10% of Pop. Daily (1% FNR)
- 10% of Pop. Daily (5% FNR)
- 10% of Pop. Daily (20% FNR)
- Once Per Year Random (1% FNR)
- Once Per Year Random (5% FNR)
- Once Per Year Random (20% FNR)

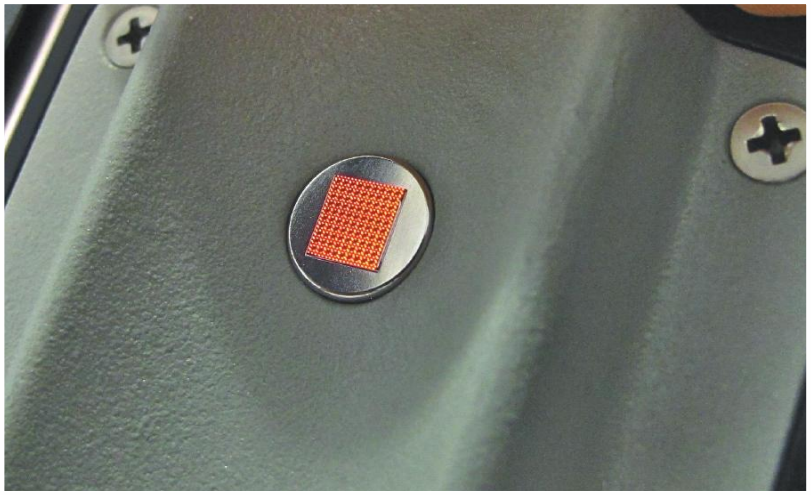
Daily testing detects virtually all offenders in less than 60 days
Random testing has detected ~15% of offenders after 2 years

Alcohol Screening with one touch!

- ✓ **Uses safe, near infra-red (NIR) spectroscopy**
  - Skin illuminated with harmless light
- ✓ **Completely non-invasive**
  - Only passive contact with skin required
  - No body fluids – No biohazards
  - No consumables
- ✓ **Integral biometric identity verification**
  - Self administered testing

TruTouch 2500 – how it works

- ✓ **The optical touch pad transmittes near infra-red (NIR) light**
- ✓ **The reflected light is analyzed to determine the tissue alcohol concentration**

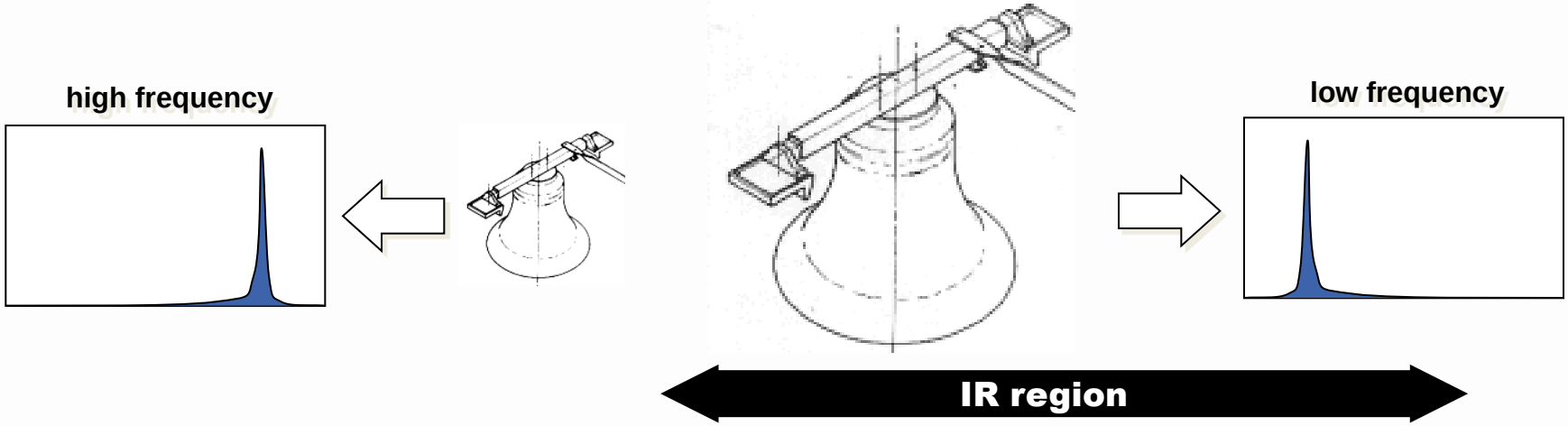


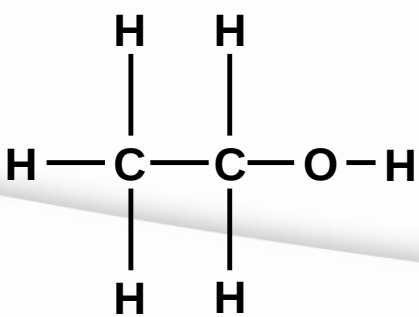
Measurement technique

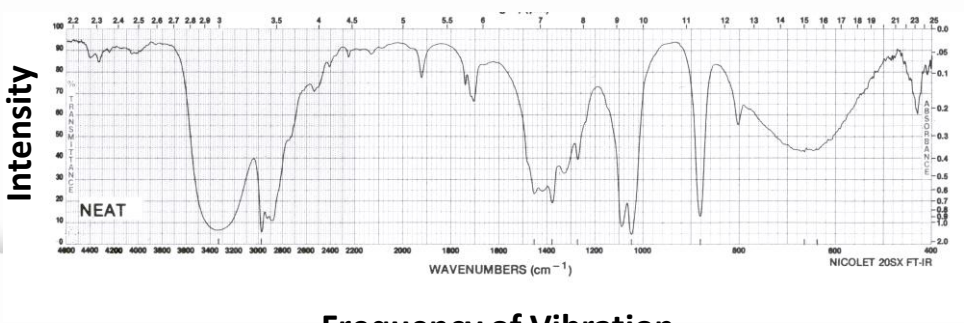
IR Spectroscopy: molecular 'ringing'

IR energy corresponds to molecular *vibrations*

- Like the ringing of a bell, the frequencies of the vibrations depend on the structural characteristics of the body → Different bell, Different ring



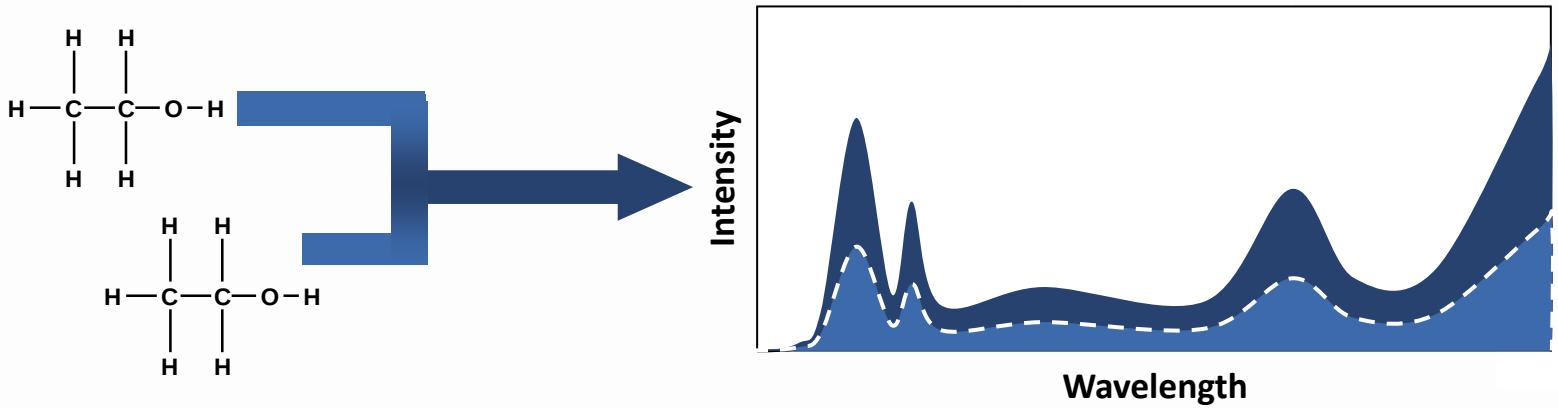




Frequency of Vibration

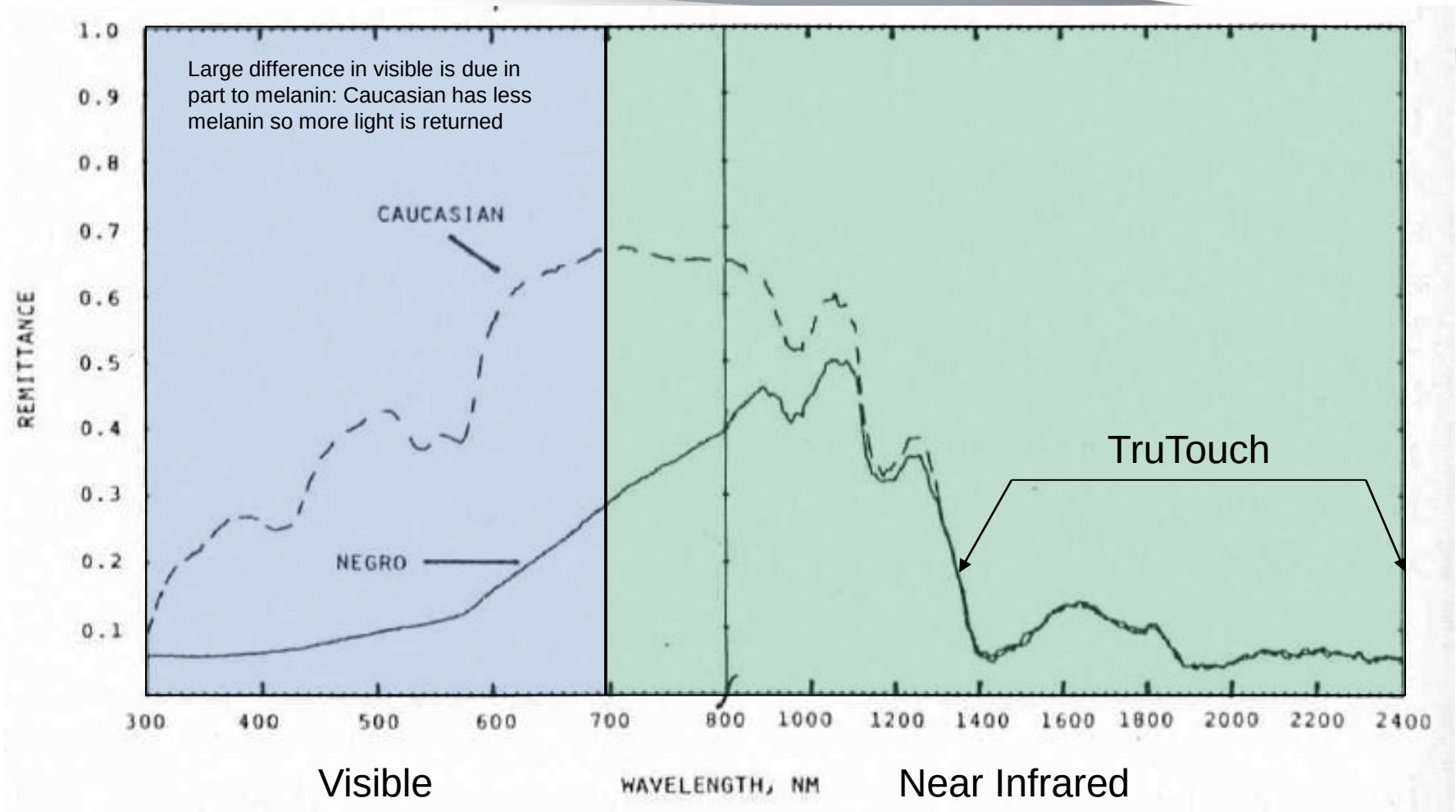
Sensitivity via Beer's Law

Beer's Law states that the *magnitude* of that fingerprint *depends on the number of molecules* vibrating → Sensitivity



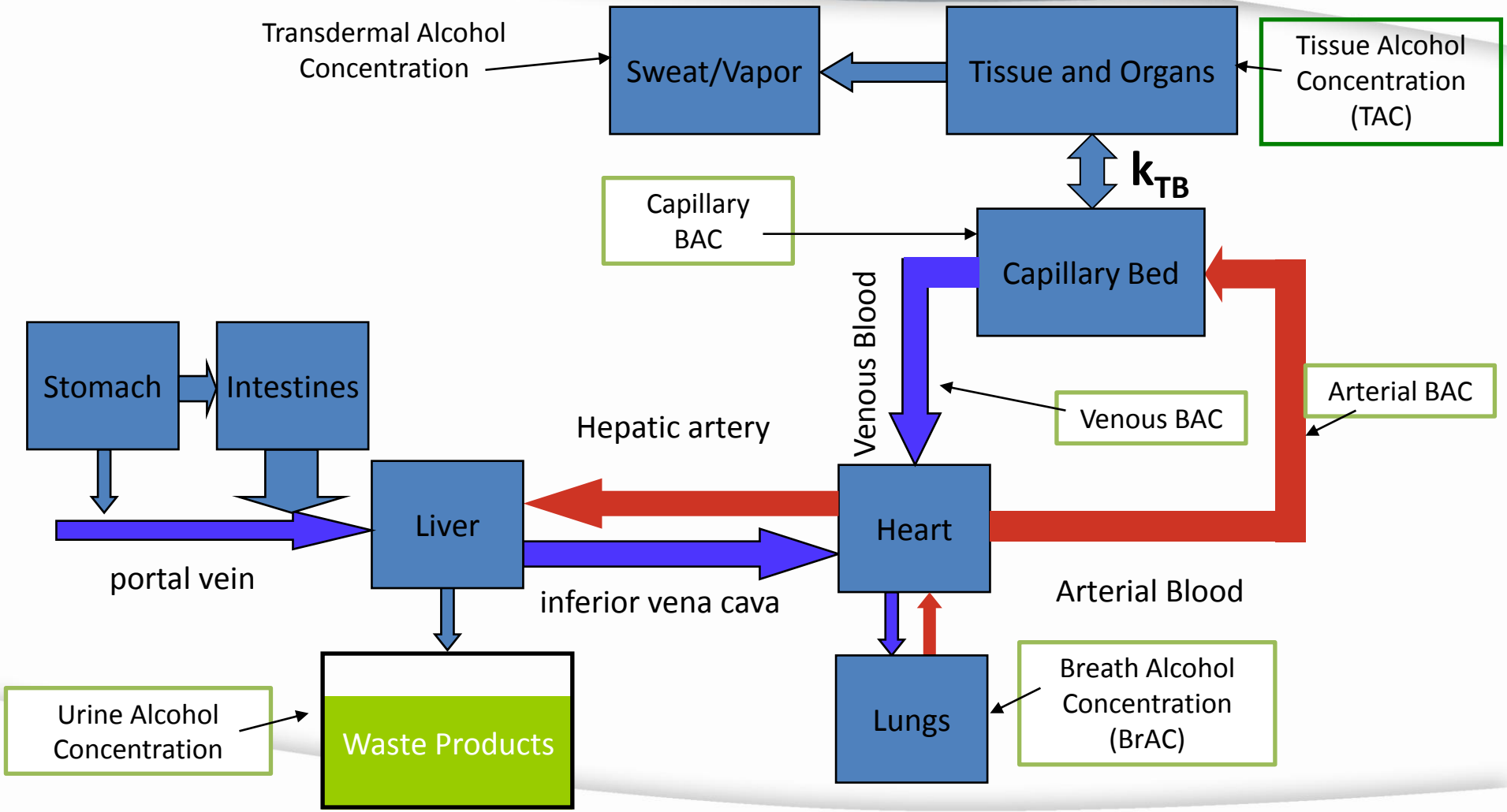
Alcohol measurment in tissue

Melanin in the Visible and NIR Regions

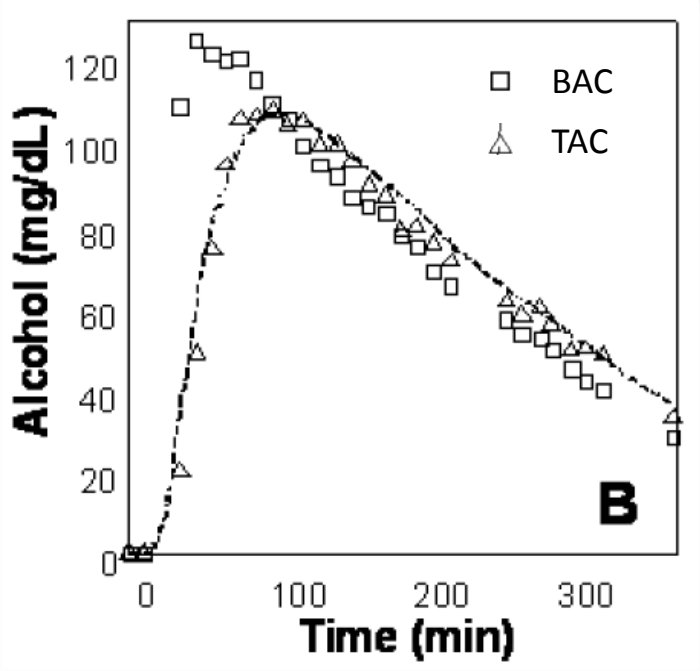


RR Anderson, JA Parrish, "The Optics of Human Skin" The Journal of Investigative Dermatology, Vol. 77, No. 1., pp. 13-19, 1981.

Alcohol Distribution

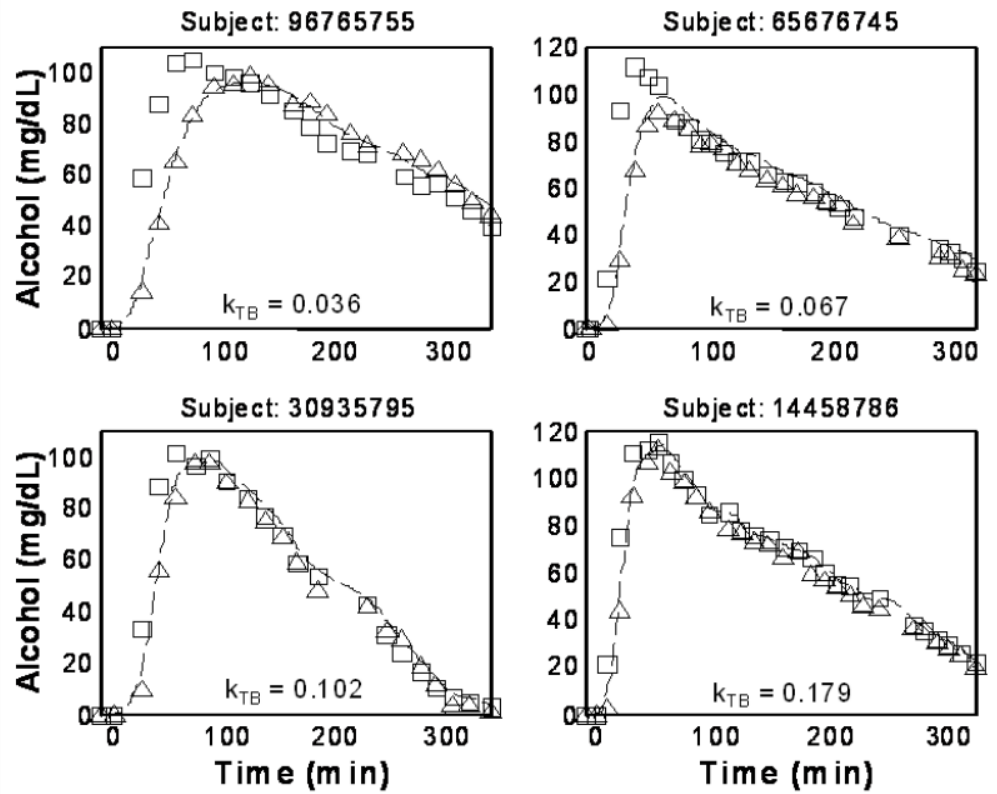


Alcohol Distribution BAC vs. TAC



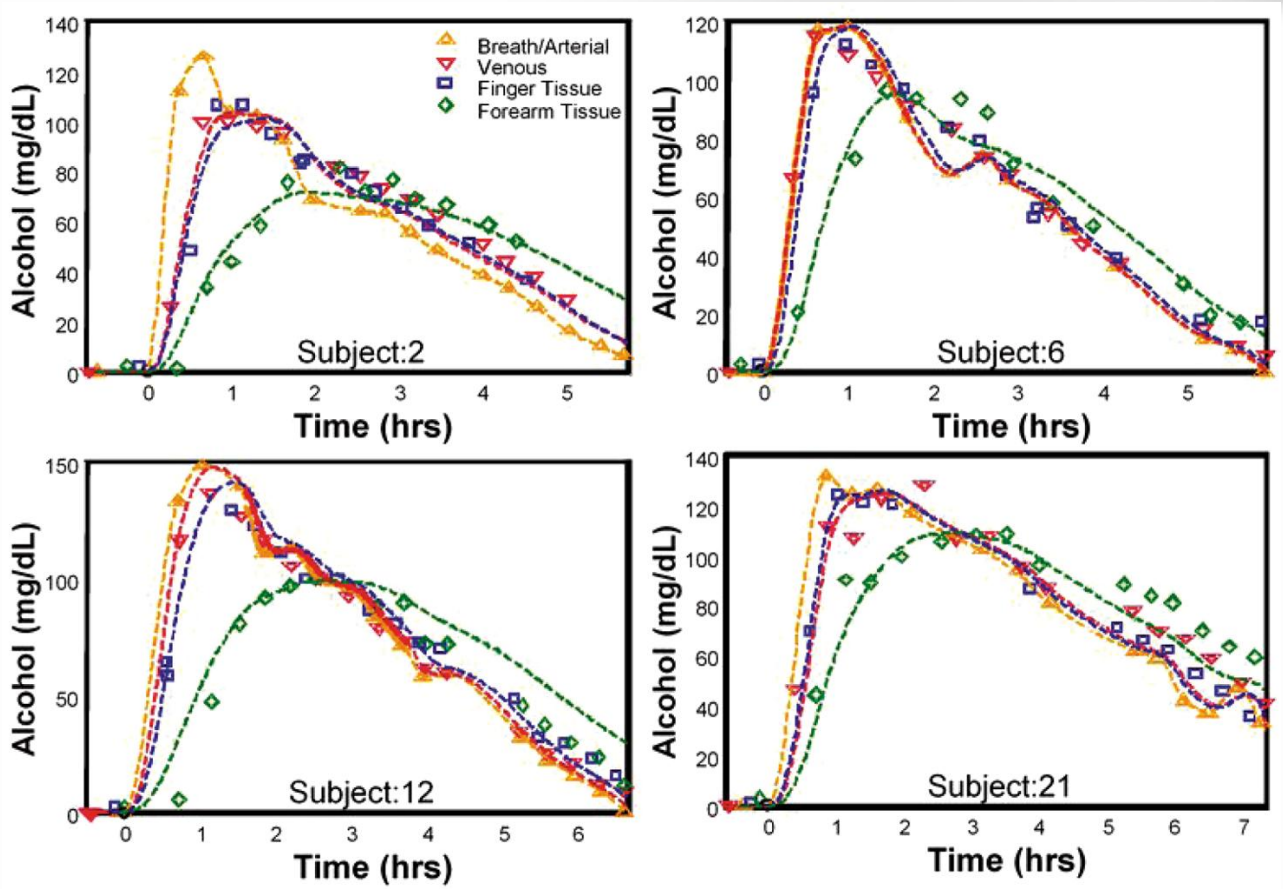
k_{TB} depends on:

1. BMI index (about 15%)
2. Ethnicity (6%)
3. Temperature (4%)
4. Age (1%)
5. Other (unknown) factors (74%)



T. Ridder *et al.*, Proc. of SPIE, Vol. 7186, 2009

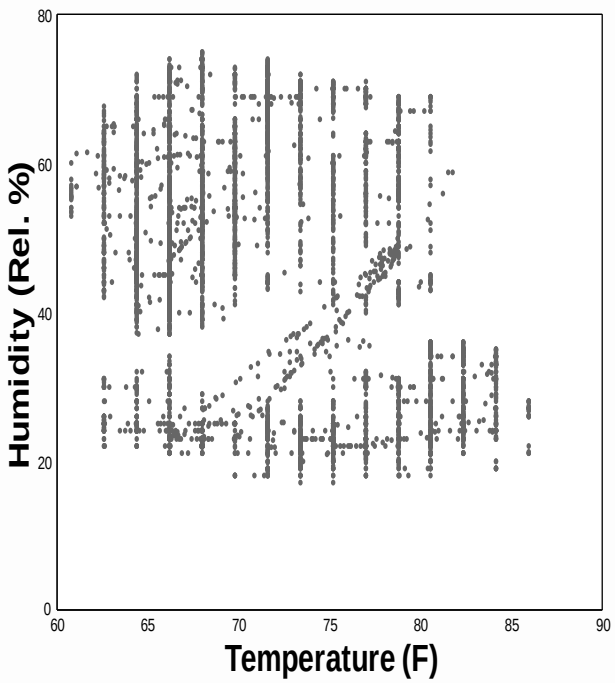
Alcohol Distribution BAC vs. TAC

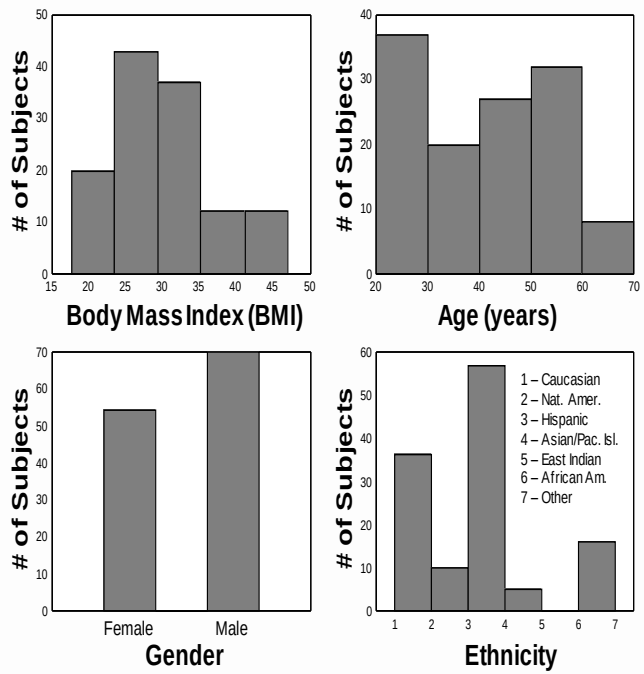


⇒ **TAC of finger tissue correlates better with BAC than TAC of forearm tissue**

Clinical study on alcohol measurements

TruTouch Study – Alcohol Measurements



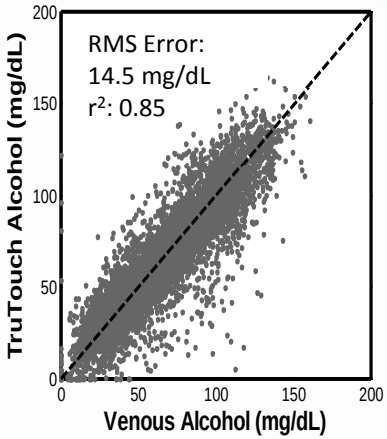


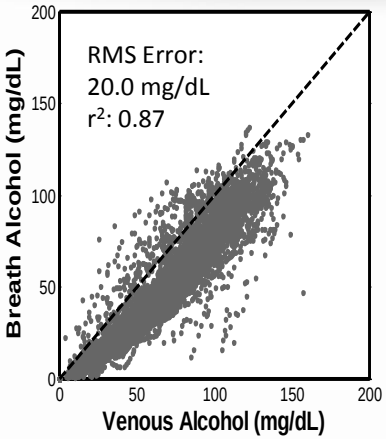
Environmental Conditions

Demographics

- **108 Participants**
  - Target Alcohol Level: 0.120%
  - Variations in Age, Weight, Ethnicity, and Gender
  - Environmental Effects Tested: Temperature & Humidity

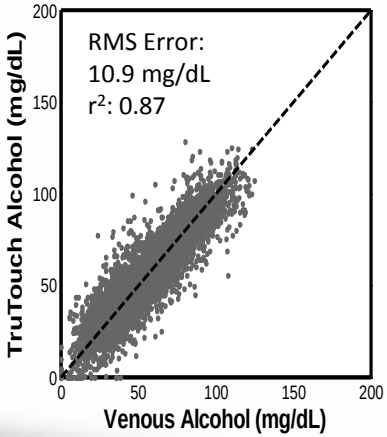
TruTouch 2500 Study – Alcohol Measurements

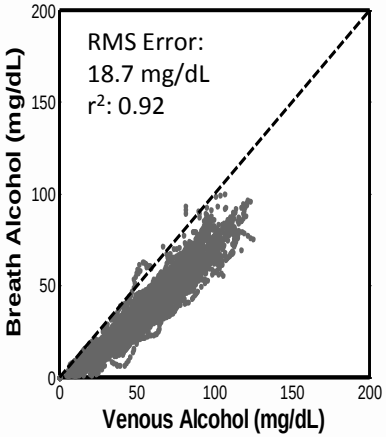




All Measurements:

6261 measurements from 108 patients





Elimination Only:

4288 measurements from 108 patients

Biometrical identification

Source of TruTouch Biometric Signal

All people are comprised of the same chemical building blocks

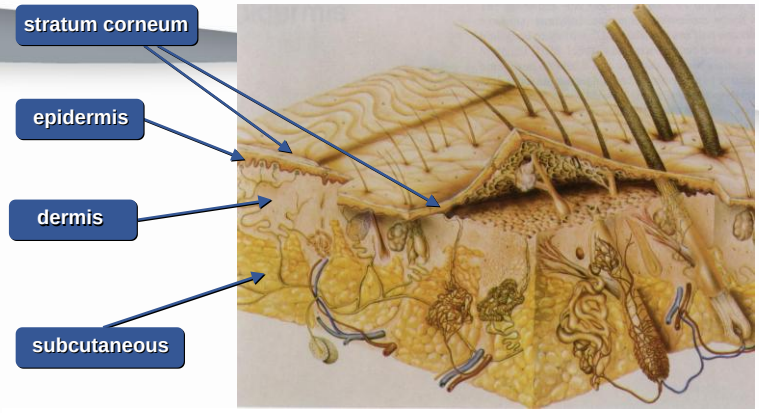
- Water, proteins, etc.

However, each person has unique:

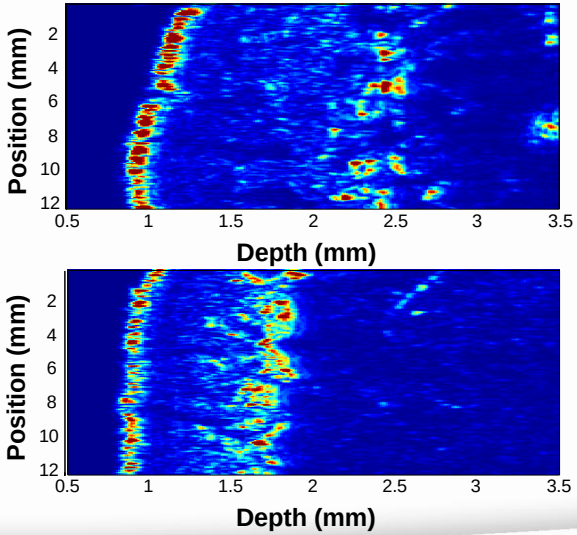
- Tissue Structure – skin layer thicknesses
- Tissue Chemistry – the concentrations of the building blocks

Both contribute to the TruTouch biometric measurement

- They just contribute in different relative amounts

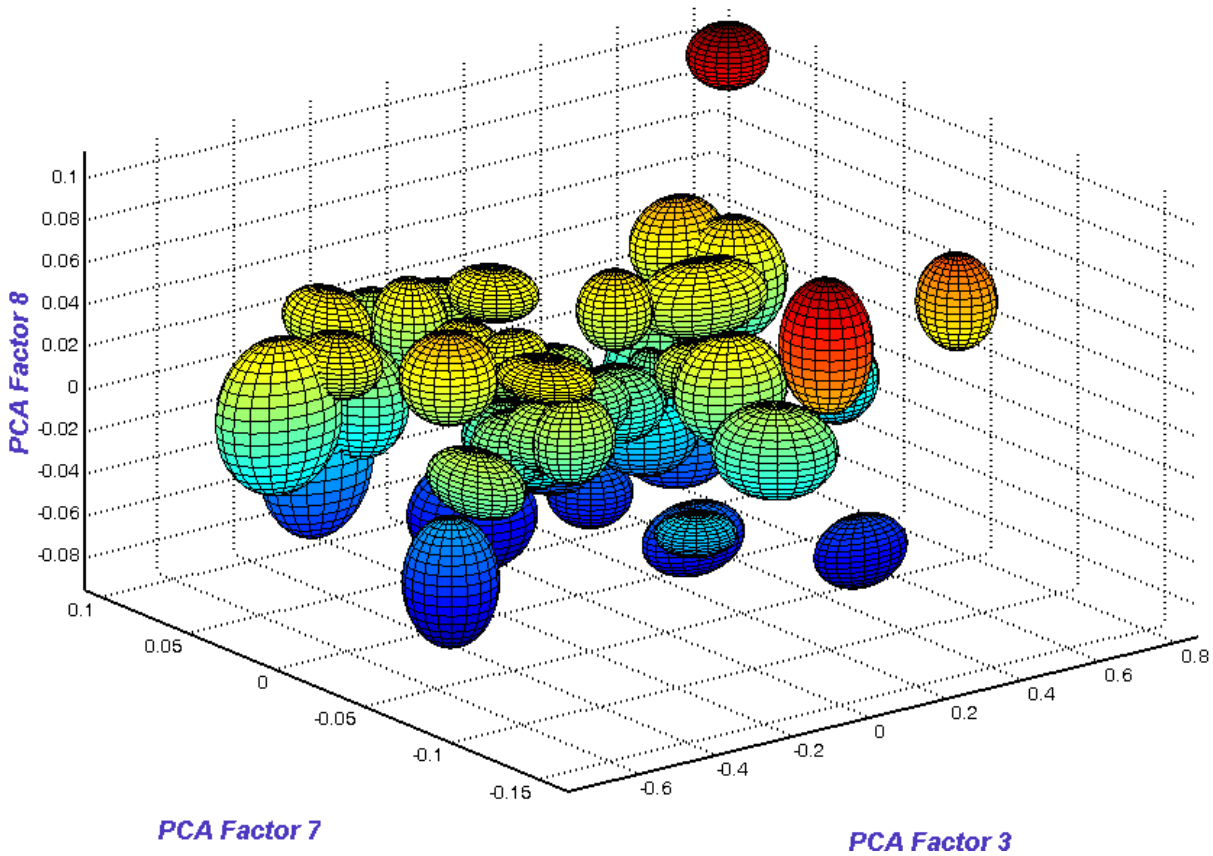


Skin has multiple layers with different thicknesses and chemistry



Skin ultrasound images from two individuals that shows different layer thicknesses

Resolution of Individuals



3 properties were selected and their scores plotted

Ellipsoids were then drawn around the points associated with each individual

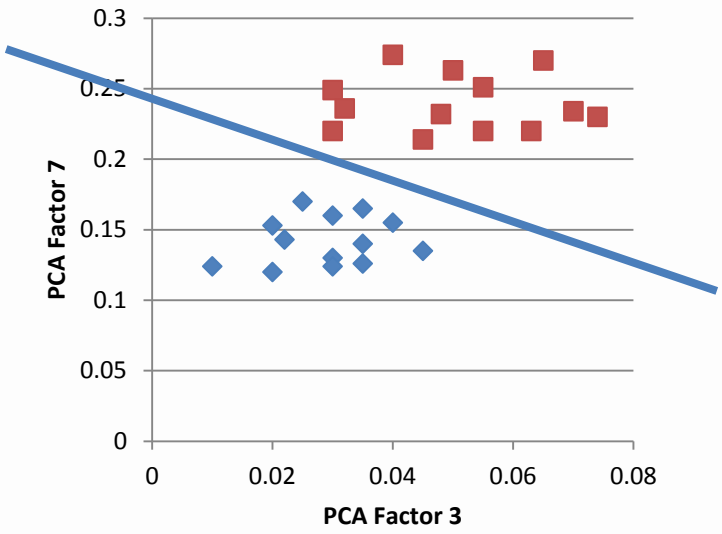
Each ellipsoid encompasses the data from only one individual

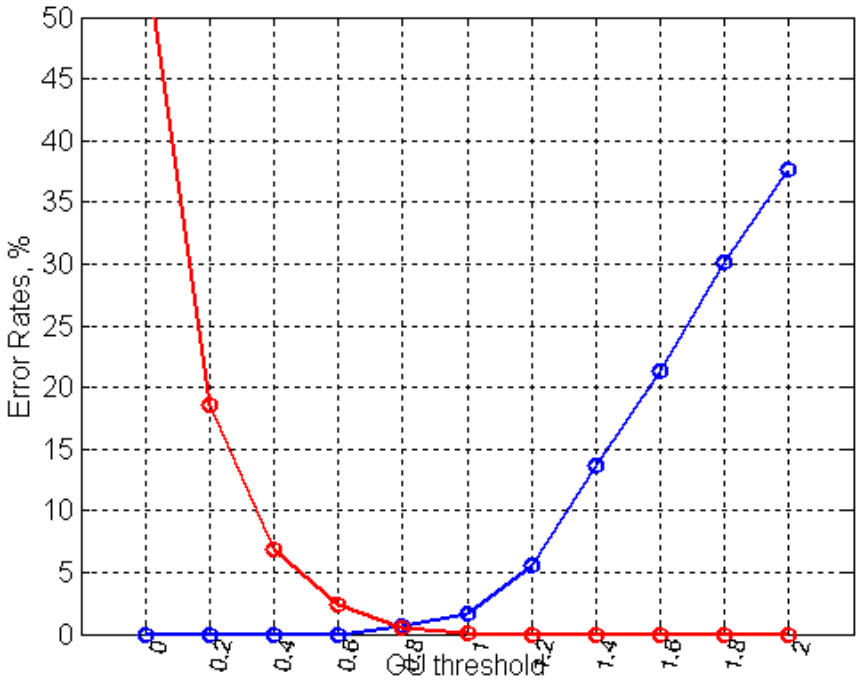
Each axis corresponds to a property (Factor)

Location of ellipsoid indicates the amount of each shape

Individuals are separating from each other using only 3 properties – more are readily available

Resolution of Individuals





Application areas

TruTouch – Application area

- ✓ **~180 people per hour**
- ✓ **Walk up or enroll (biometric identification)**
- ✓ **Measurement time: 18 s (average time in enrolled mode)**
- ✓ **LOD: 0,25‰**
- ✓ **Data and biometric database reside on network**
- ✓ **Units can be networked together, across a network in the same or multiple sites**
- ✓ **Can be integrated in turnstiles, time and attendance clocks etc.**
- ✓ **Can be integrated in existing company ID system/ access control**

TruTouch – Application area

- ✓ **Pre-employment or frequent testing**
- ✓ **Before / during / after shifts**
- ✓ **Test at natural choke points**
- ✓ **Access gates**
- ✓ **Safety sensitive employees and contractors**
- ✓ **Test drivers at point of departure, point of arrival or both**
- ✓ **Deploy selectively (remote locations, problem locations) or use broadly**
- ✓ **Test using mobile concept**

TruTouch – Final Product Concept

Thank you for your attention

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