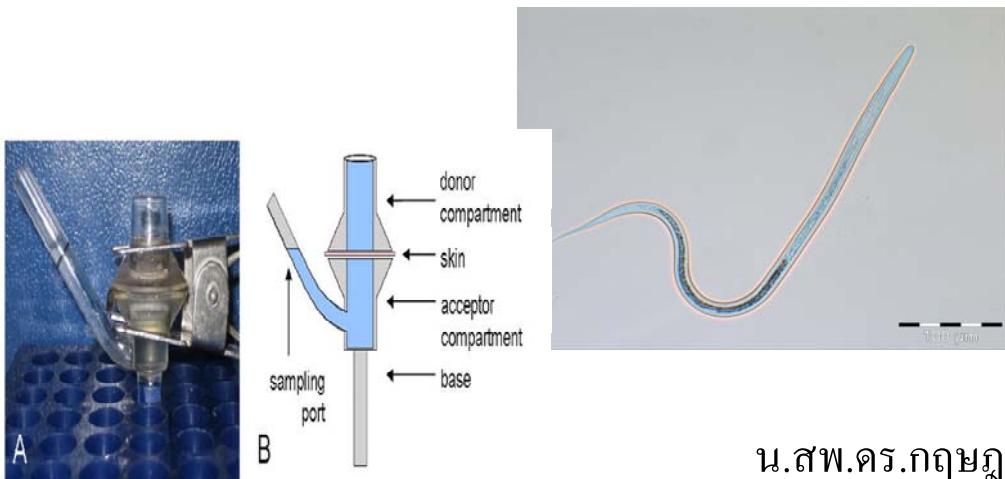


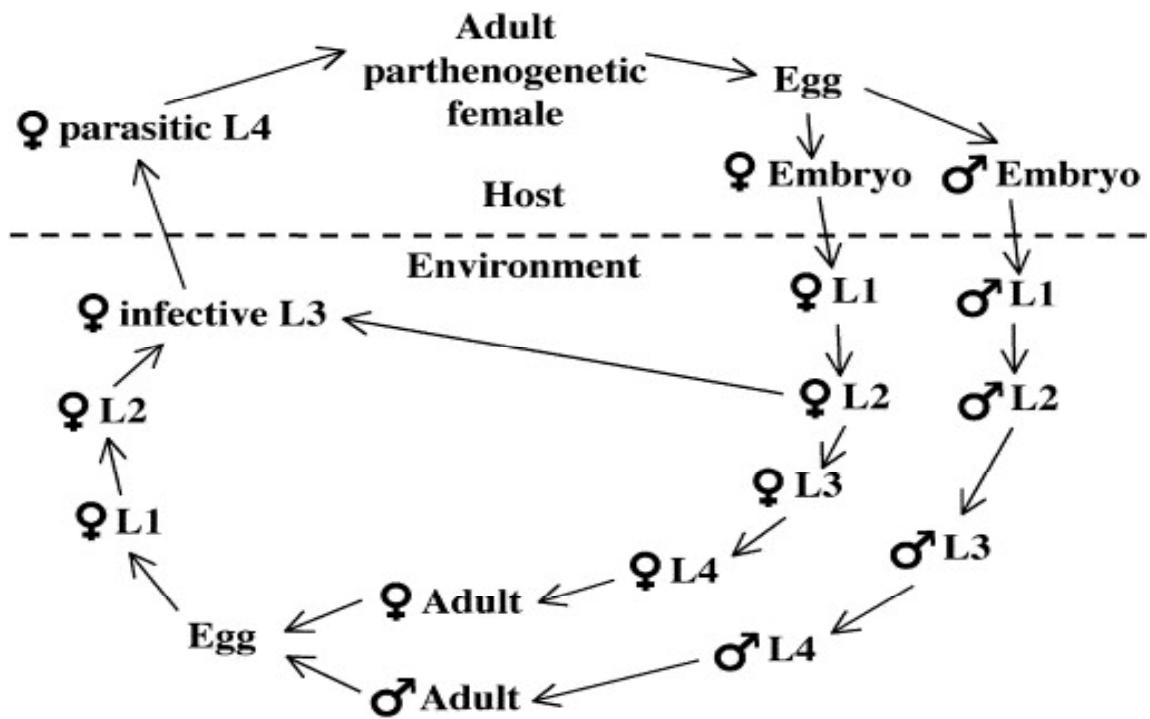
# *Skin penetration by nematode larvae-1*



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## *Introduction*



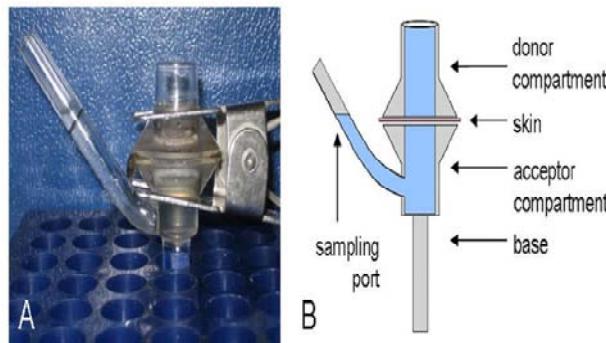
The life cycle of *Strongyloides papillosum* (Levine, 1968; Eberhardt et al., 2007)

# *Skin penetration models*

- *In vivo*



- *In vitro*



*In vivo*

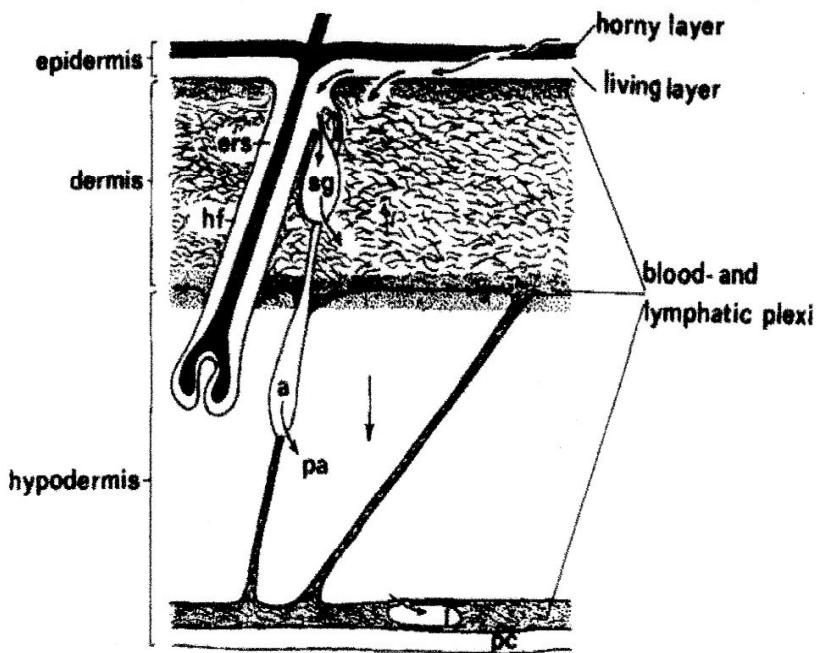


ໃນປີ ດ.ສ. 1977

ໂດຍ Vetter ແລະ Leegwater-v.d. Linden

-Puppies

**Fig. 1.** *A. brasiliense*: Plastic ring glued to the lateral portion of the skin filled with sterilized soil and infective larvae



**Fig. 2.** Diagram of the lateral portion of the skin. The arrows show the path of migration of *A. brasiliense*. *hf* = hair follicle; *ers* = external root sheath; *sg* = sebaceous gland; *a* = apocrine sweat gland; *pa* = panniculus adiposus; *pc* = panniculus carnosus; *l* = lymphatic vessel

(Vetter and Leegwater-v.d. Linden, 1977)

## *In vitro*

ໃນປີ ດ.ສ. 1975 ໂດຍ Franz

-Human skin: permeability of organic compounds

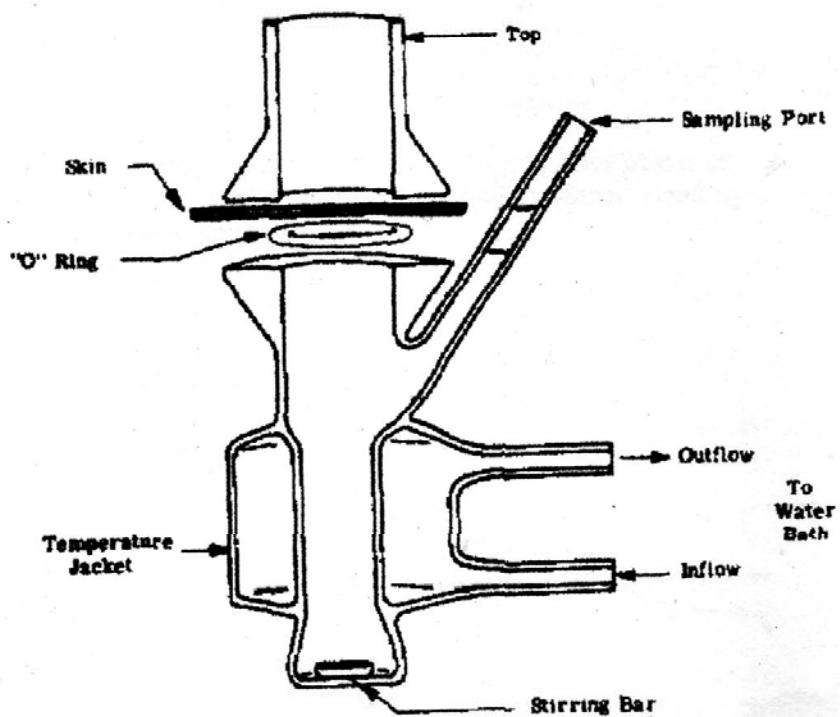


FIG. 1. Schematic representation of the diffusion cell used in these studies. Top is open to the ambient laboratory environment.

(Franz, 1975)

### *In vitro*

ในปี ก.ศ.1982 โดย Matthews

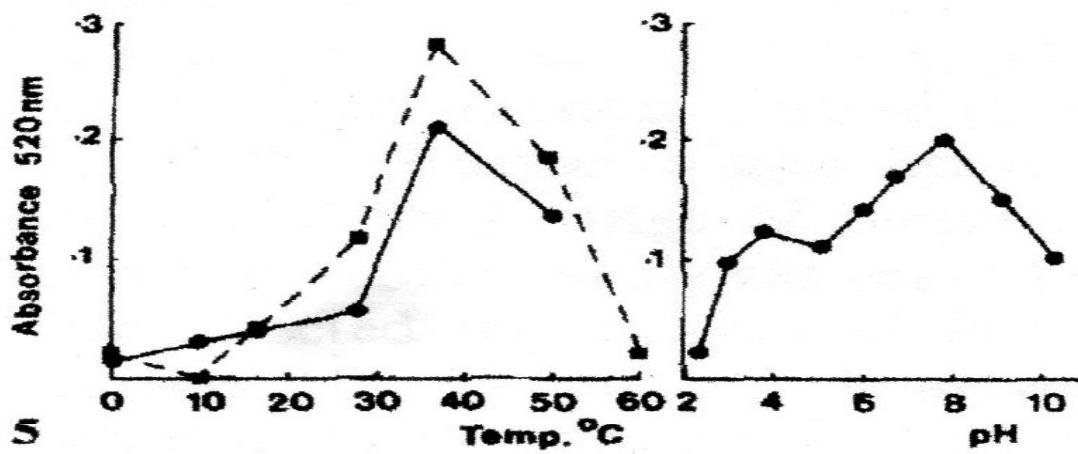
-Human skin: penetration by *Necator americanus*

lavae

- epidermal and dermal directions

- Enzyme activity (azocoll substrate)

## *In vitro*



(Matthews, 1982)

## *In vitro*

ในปี ก.ศ. 2010 โดย Sakura และ Uga

-Animal skins: penetration by *Strongyloides ratti* larvae

-EM of skin penetration

# *In vitro*

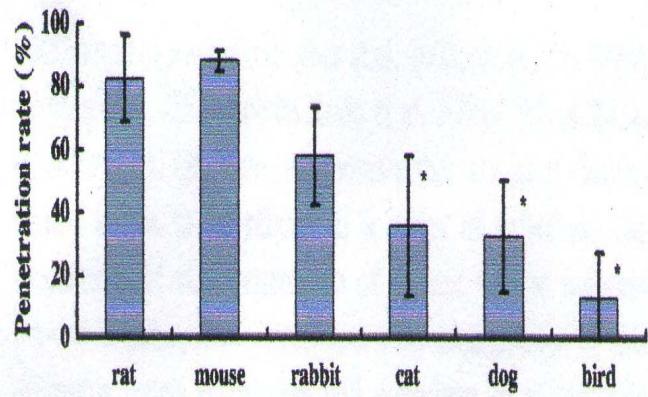


Fig. 4 Comparison of penetration rates between definitive and indefinite hosts. All values are mean $\pm$ SD (rat,  $n=12$ ; mouse,  $n=3$ ; rabbit,  $n=4$ ; cat,  $n=4$ ; dog,  $n=8$ ; bird,  $n=3$ ). Asterisks indicate  $P<0.01$  (vs. rat, Scheffe's  $F$  test)

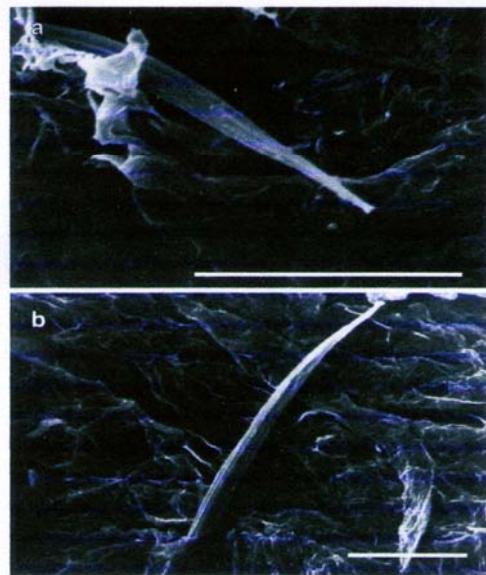
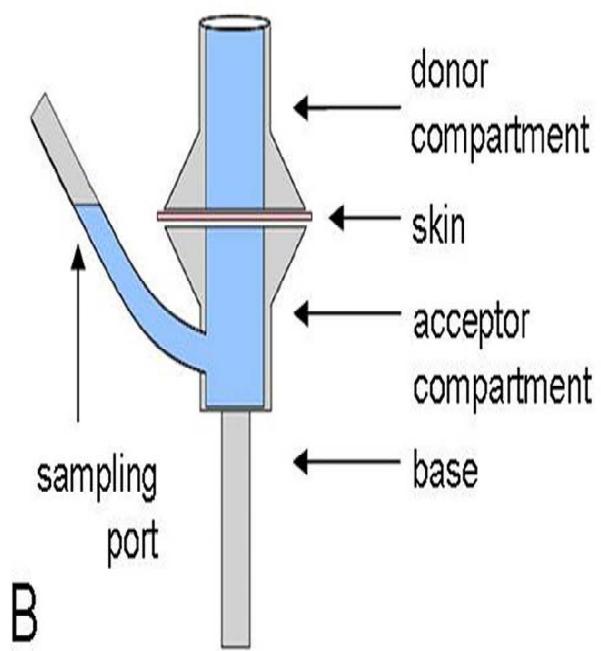


Fig. 5 Scanning electron microscopic observation of skin penetration of L3s. L3 penetrated the skin via epidermal scale (a) and directly (b). Bars, 50  $\mu$ m

(Sakura and Uga, 2010)

## *PERL-chamber system: An illustration and a schematic drawing*



(Franke et al., 2011)

# *Assessment of migration ratio*

Migration ratio (%) = [larvae<sub>acceptor</sub> / (larvae<sub>donor</sub> + larvae<sub>acceptor</sub>)] X 100

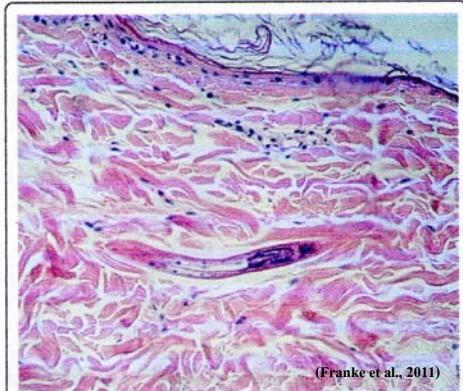
Ex. **10** remained larvae in don.comp. and **50** recovered larvae in accep.comp.

$$\text{Migration ratio} = \frac{\text{50}}{\text{10} + \text{50}} \times 100 = 83.33\%$$

(Franke et al., 2011)

## *Summary*

- Using enzymes for skin penetration
- Both directions: epidermal and dermal sides



(Franke et al., 2011)

**Figure 2** Larvae of *A. caninum* crossing dog skin *in vitro*.  
Longitudinal section, HE-staining (400X magnification).

# *References*

- FRANZ, T. J. (1975):Percutaneous absorption on the relevance of in vitro data. *J. Invest. Dermatol.* **64**: 190-195.
- FRANKE, D., C. STRUBE, C. EPE, C. WELZ and T. Schnieder (2011):Larval migration in PERL chambers as an *in vitro* model for percutaneous infection stimulates feeding in the canine hookworm *Ancylostoma caninum*.*Parasites & Vectors* **4**:7 4.
- MATTHEWS, B. E. (1982):Skin penetration by *Necator americanus* larvae. *Z. Parasitenkd.* **68**: 81-86.
- SAKURA, T. and S. UGA (2010):Assessment of skin penetration of third-stage larvae of *Strongyloides ratti*.*Parasitol. Res.* **107**: 1307-1312.
- VETTER, J. C. M. and M. E. LEEGWATER-V. D. LINDEN (1977a): Skin penetration of infective hookworm larvae. I. The path of migration of infective larvae of *Ancylostoma braziliense* in canine skin.*Z. Parasitenk.* **53**: 255-262.

*Thank you for your attention*