conception, the normal course of pregnancy, and the intrauterine development and viability of the conceptus. (Table and Addendum.)

The degree of severity of these effects was influenced by the amount of daily food provided during pregnancy. Prenatal values for live fetuses, dead fetuses and resorption sites and fetal weights were significantly affected by maternal underfeeding. Pregnancy rate was also adversely affected by the reduced nutritional intake.

Discussion and conclusion. Drastic nutritional deprivation resulting in interruption of pregnancy or loss of the conceptus has been well established. However, effects of less severe undernutrition has not received sufficient attention. The above experiment demonstrated that with drastic ($^1/_2$ of control diet) underfeeding only 20% of the mated mice conceived. With lesser but still substantial ($^2/_3$ of control diet) undernutrition the conception rate of mated mice was 40%. The same dietary restrictions when practiced throughout pregnancy had severe effects on the intrauterine survival of the embryos. Further perinatal and postnatal studies are needed since reduced dietary intake during pregnancy is gaining popularity.

Central Venous Pressure: Normal Value and Length of Body

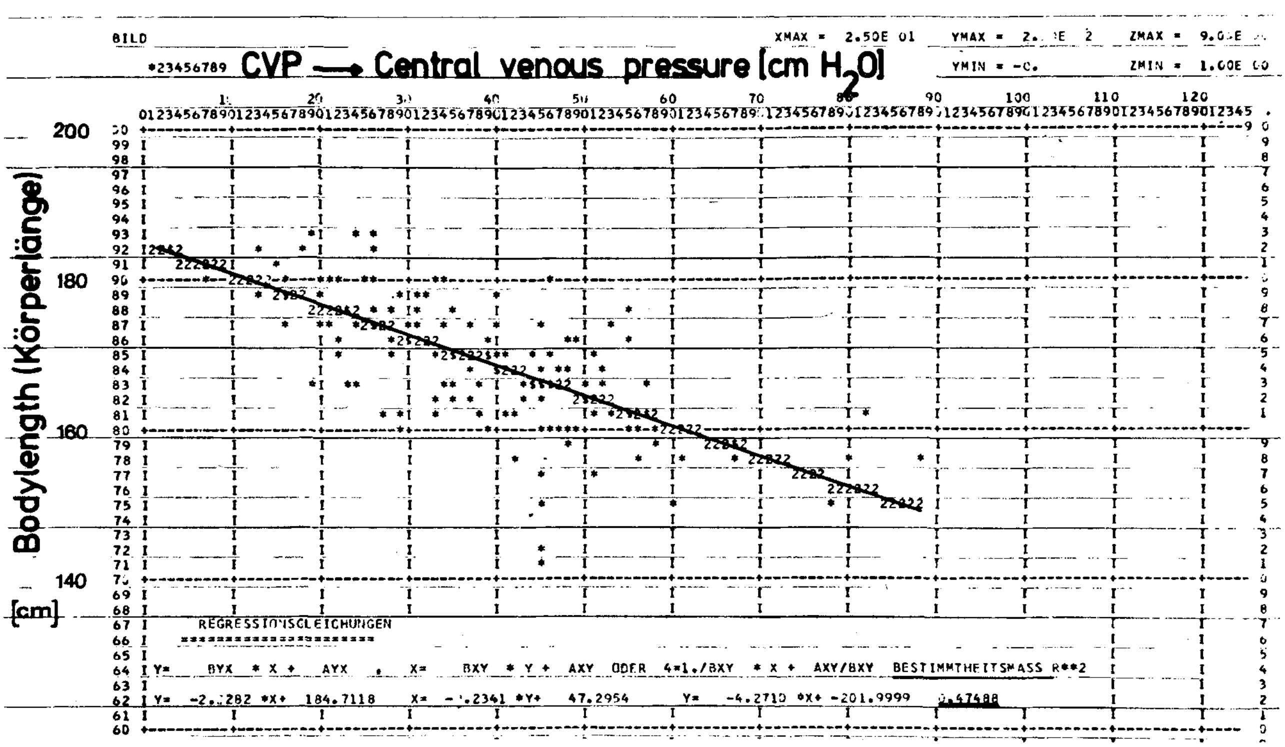
P. ECKERT and R. EICHEN

Chirurgische Klinik der Universität Hamburg, Universitäts-Krankenhaus Eppendorf, Martinistrasse 52, D-2 Hamburg 20 (Federal Republic of Germany, BRD), 1 March 1976.

Summary. The CVP ranges between 2 and 12 cm H_2O, and has an 'error' of 2 l of blood. In 172 normal persons, we found a correlation between the CVP and the length of the body.

The clinical meaning of the central venous pressure is not finally determined because of the wide physiological norm. The deviation range is stated to be 2–12 cm H_2O and has, corresponding to the elasticity coefficience E′[1], an 'error' of approximately 2 l of blood. There is no doubt that a constant relation is present between the intrathoracic blood volume and the central venous pressure at rest; but this does not apply to shock, exsiccosis or renal insufficiency[2].

Changes of venous tonus, respiration, heart frequency and cardiac output play a crucial role here. To determine exact physiological limits of normal, we have measured the central venous pressure at rest in 172 people with a healthy blood circulation between the ages of 3 and 73 years, after the method of GAUER and SIECKER[1]. The simultaneous registration of the ECG made the exact evaluation after the P-wave possible. As according to KNEBEL and WICK[3] the expiratory phase of respiration



The correlation between the body length and central venous pressure (n = 172) gives the following regression equation:

$$Y\ (\mathrm{CVP}) = 2.0282\,X + 184.7118$$
$$(X = \text{body length}).$$

The coefficient of correlation of 0.68 shows a close relationship.

of the transmural pressure is constantly being slightly moved as opposed to the central venous pressure, only the end of the expiratory respiration phase was considered.

The following findings were recorded: 1. There is a close correlation between the central venous pressure and the length of the body (Figure). 2. Contrary to the peripheral venous pressure, the central one shows no age dependence. 3. Small children have a relatively high central venous pressure, explained by the 'physiological centralization'[4]; the relationship = length of the body: the central venous pressure applies only to a length over 140 cm. 4. Measured under constant conditions, the central venous pressure is the same for every experimental person over a number of weeks. 5. No relationship between the central venous pressure and the body weight, sex, haematocrit and total protein in the serum is seen.

Our findings made a more exact physiological correlation between the central venous pressure and the corresponding length of the body possible. Similar relationships are known for the cardiac output, plasma volume, total blood amount and other values[2]. The practical consequence of the results for the clinic is the possibility of a more exact volume substitution which necessitates the registration of the venous pulse. Loss of volume and changes of the venous tonus (cold, pain, respiration, etc.) are always expressed in a distortion of the venous pulse before distinct pressure changes become measurable.

[1] O. H. Gauer, in *Physiologie des Menschen* (Eds. O. H. Gauer, Jung and Kramer; Urban & Schwarzenberg, Berlin 1972), vol. 3, p. 229.
[2] P. Eckert, *Das Niederdrucksystem, Physiologie und Klinik* (G.-Thieme-Verlag, Stuttgart 1976), p. 13.
[3] R. Knebel and E. Wick, Z. Kreislaufforsch. *47*, 623 (1959).
[4] F. Graser, in *Die physiologische Entwicklung des Kindes* (Ed. F. Linneweh, Springer-Verlag, Berlin, Heidelberg, New York 1959), p. 92.

The Change of Vagal Activity Evoked by Spinal Cord Thermal Stimulation in Anesthetized Rabbits

M. Iriki and Emi Kozawa

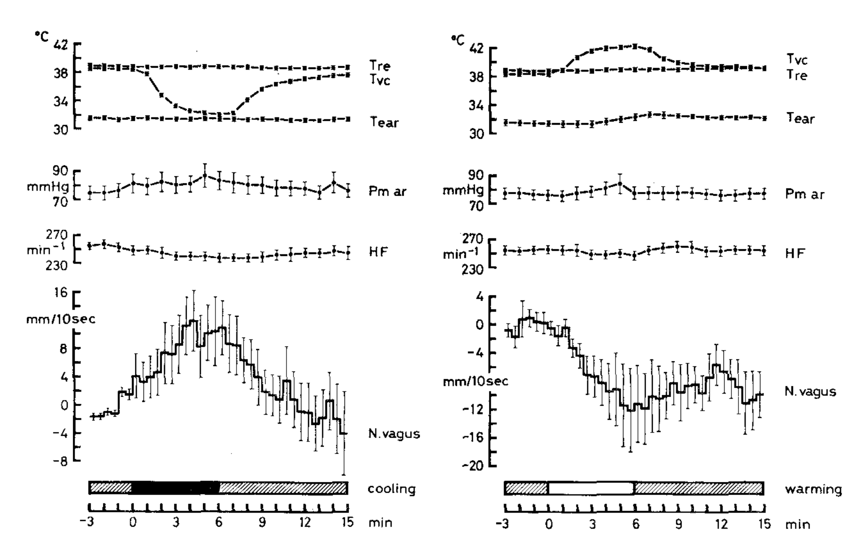
Department of Physiology, Tokyo Metropolitan Institute of Gerontology, 35–2 Sakaecho, Itabashiku, Tokyo 173 (Japan), 25 March 1976.

Summary. Vagal activity decreased significantly during spinal cord warming and increased significantly during spinal cord cooling in anesthetized, immobilized rabbits. The results provide the first direct proof of changes in parasympathetic activity during spinal thermal stimulation.

Thermal stimulation of the spinal cord elicits changes in various autonomic functions, for instance, circulation, respiration, shivering and non-shivering thermogenesis and sweating (reviewed by Simon[1]). Changes in regional sympathetic activity provide one of the important underlying mechanisms involved in these responses[2,3]. Despite the fact that autonomic functions are well kown to be regulated normally not only by the sympathetic system, but also by the parasympathetic system, participation of the parasympathetic system in these autonomic changes has not been reported. In this experimental series, the change in activity of vagal efferents during spinal thermal stimulation were directly investigated to clarify this problem.

Methods. The experiments were performed with 10 rabbits of either sex weighing 1.8–2.6 kg. The animals were anesthetized with sodium pentobarbital (40 mg/kg as initial dose and subsequent continuous infusion of 14 mg/animal/h) and immobilized with succinylcholine (40 mg/animal as initial dose and subsequent infusion of

[1] E. Simon, Revue Physiol. Biochem. Pharmac. *71*, 1 (1974).
[2] O.-E. Walther, M. Iriki and E. Simon, Pflügers Arch. *319*, 162 (1970).
[3] M. Iriki, W. Riedel and E. Simon, Jap. J. Physiol. *22*, 585 (1972).



Integrated vagal activity (N. vagus), rectal, vertebral canal and ear temperatures (T_{re}, T_{vc}, T_{ear}), arterial mean pressure (Pm ar) and heart rate (HF) as influenced by spinal cord cooling (left figure) and warming (right figure) in anesthetized, immobilized rabbit. Mean values from 10 experimental animals with standard errors. The courses of vagal activity are visualized by graphing the changes in amplitude of integrator signals in mm/10 sec, reference level: average integrator signal amplitude during the prestimulation period.