

*Citation:*

Melle, A..M. van, Some reflexes on the respiration in connection with LABORDE'S method to restore by rhythmical traction of the tongue, the respiration suppressed in narcosis, in:  
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meter, I did not notice a minimum of the molecular diminution of vapourpressure; it is possible that the cause of this is as follows:

At about 100°, I observed a minimum at the concentration of 0.5 gr. mol.; should the position of this minimum alter with the temperature which is quite possible, it may occur that at lower temperatures it is displaced in the direction of still more dilute solutions and that at 0° it may fall below the concentrations with which I was able to make sufficiently accurate observations.

To decide whether there really is a minimum which changes its position with the temperature, I propose to make further measurements of the diminution of vapourpressure of solutions at temperatures between 0° and 100°.

*Amsterdam*, University Chem. Laboratory.  
April 1900.

**Physiology.** — “*Some reflexes on the respiration in connection with LABORDE’s method to restore, by rhythmical traction of the tongue, the respiration suppressed in narcosis*”. By M. A. VAN MELLE (Communicated by Prof. C. WINKLER).

In the *Weekblad van het Nederlandsch Tijdschrift voor Geneeskunde*, March 31, 1900. Dr. WENCKEBACH inserts a note on LABORDE’s communications in the Académie de Médecine, which are published in the *Bulletins de l’Académie de Médecine*, N°. 45 1899 en N°. 2, 4, 5, 6. 1900 and with slight modifications in the *Comptes Rendus de la Société de Biologie*: 1899. N°. 39 and N°. 2, 4, 5. 1900.

In this communication LABORDE gives fuller details about a method in which rhythmical traction of the tongue is used to restore the paralyzed respiration. An explanation is to be found for this phenomenon, as it cannot be considered as anything but a reflectory action, originating from the sensible nerves of the first air-passages on the so-called centres of respiration. LABORDE thinks, that according to his experiments the reflectory action depends on the Nn. laryngei superiores, the electrical and mechanical excitation of which brings about an “arrest” during the active respiration, whereas it restores the respiration when the latter was suppressed.

In the laboratory of Prof. WINKLER, under whose guidance important investigations on the mechanism of the respiration have been

made<sup>1)</sup>, I have tried to find further data about the effect on the respiration of the excitation of some periferic nerves. I have to return thanks to Mr. VAN CALCAR and Mr. H. JAGER for their valuable assistance. Since the impulse to this investigation which MARSHALL HALL's "Treatise of the Nervous System" gave in 1840, many experiments have been made on this subject, but on the whole the results do not agree very well. The difference of animals experimented on, of the conditions under which the experiment was made, of the nature of the excitation used, is so difficult to bring under simple points of view, that I thought it desirable to make a new attempt under conditions as much the same as possible.

For want of time I could make only a beginning with this very interesting study of the automatism of respiration, the knowledge of which is of the highest importance both from a physiological and a clinical point of view. Nevertheless it seems to me, specially with a view to LABORDE's opinion, that I am justified in communicating some of the obtained results.

The animals experimented on were dogs, almost all of the same species. The experiments were made in narcosis of pure chloroform. In the beginning this gave difficulties as it is a well-known fact, that dogs which are not morphinized, react very violently on the inhalation of chloroformvapours and therefore often succumb of the narcosis.

On purpose I did not make use of the mixed morphia-chloroform narcosis, because morphia introduces a factor, by no means to be neglected in the mechanism of respiration (as proved by the well-known morphia-sigh) which indicates over-irritability of inspiration-centres.

The chloroform also introduces an unknown factor, but this seemed to me a peremptory demand of humanity. Moreover if dogs are not narcotized there is also an unknown factor acting, because pain makes the respiration strongly irregular. When the narcosis with pure chloroform has become complete, it gives a fine regular respiration, which changes as long as active stimulation lasts, but generally returns immediately to the normal condition.

The explanation of the violent reaction, which takes place in the beginning of narcosis, is not found, as we should be inclined to assume, in the disagreeable irritating action of the chloroform on

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<sup>1)</sup> Proc. Roy. Acad. Amsterdam Oct. 29, 1898 and March 25, 1899. Dr. WIARDI BECKMAN. Diss. Inaug. 1899. Amsterdam. De invloed van de schors der voorhoofds-hersenen op de ademhaling.

the olfactory mucous membrane, for I found the same reaction with one of the dogs, narcotized through the trachea after tracheotomy. This occurred, when I wanted to stimulate the fila olfactoria by means of electricity and therefore would not paralyze them beforehand by chloroform vapours. This violent reaction, when found with dogs which had been first tied, may cause the dogs to succumb; if however, we leave a possibility of free movement, which is best done by tying the dogs in a bag leaving only the head and the legs free, and the bag with the dog suspended in the air, the asphyxia is generally not found, and the further narcosis remains very calm and regular. The chloroform was administered by means of CURSCHMANN'S inhalator.

The narcosis being deep enough, tracheotomy was performed and the chloroform was administered through the tracheal canula.

The registration took place with the pneumograph of MAREY. The sensible nerves were stimulated with a moderately strong induction current. Generally, differences in the strength of the current had little influence, except that a certain minimum had to be exceeded.

Under these circumstances, in which the results show much uniformity and constancy, it appeared that the stimulation of those periferic nerves, which are exclusively composed of sympathetic nerve-fibres or contain many of them, brought about an arrest of the respiration and generally, as has been found already by HARLEY and HAMBURGER, in its expiratory position. So do the N. splanchnicus and the N. vago-sympathicus. I succeeded sometimes by mechanic stimulation of the N. splanchnicus (by traction of the entrails) in arresting the respiration for 65 seconds, as long as the stimulation lasted, while before and after the stimulation the respiration was perfectly regular. By electrical stimulation of the N. splanchnicus the same result was obtained. This proves that no centre has been disturbed by shock. The same thing is seen when the N. vago-sympathicus is stimulated (see fig. I--IV).

The excitation of the *N. laryngeus superior* gives also an arrest in the expiratory position, but has generally, in the same way as the sensible branches of the N. trigeminus, an after-effect of long duration. Some time passes before the dog breathes again calmly, and there is a tendency to get out of the narcosis. If the narcosis is very deep the effect is simple retardation (see fig. V).

That of the *N. glossopharyngeus* always gives a deep inspiratory position, as is never reached in simple breathing, but only with deep sighs. Strong currents bring about a forced deep inspiration lasting

as long as the current lasts, weak currents at the same time acceleration (see fig. VII—XI).

That of the *N. lingualis N. trigemini* always gives, just as the *N. laryng. sup.* an arrest in expiratory position, but with accelerated superficial breathings and long continued after-effects (see fig. XIII—XV).

The stimulation of the *N. hypoglossus*, the *N. accessorius* and the *N. facialis* proved to have no influence on the respiration.

The stimulation of the *fila olfactoria* appeared to be exceedingly dangerous as there was a great chance of sudden death, but, gave in some cases a curve analogous to that of the stimulation of the *N. sympathicus* (see fig. VI and fig. XII).

Under the given circumstances, i.e. chloroformnarcosis and moderately strong induction current (we cannot lay too much stress on this), all sensible nerves of the tractus intestinalis and of the airpassages proved to have a retarding influence, with the exception of *N. trigeminus*, which may be considered as being in secondary connection with the deeper organs, being primarily a sensible nerve of the outward cover of the body. The arrest is a position of rest when the *N. Splanchnicus*, *N. Vagus* and the *N. olfactorius* are stimulated and the arrest is a forced inspiratory position when the *N. Glossopharyngeus* is stimulated. This result agrees on the whole with what others, under different circumstances, have found. Yet there are important deviations in some points. PHILIP KNOLL states in the „*Sitzungsberichte der Wiener Akademie*” Bd. 86. p. 483 and Bd. 92. p. 315, that the ramus lingualis *N. trigemini* belongs to the nerves, the excitation of which always gives inspiratory effects, whereas experimenting on five dogs with numerous stimulations, I have never found an inspiratory effect, but constantly an expiratory effect with acceleration of respiration. This is of importance because the statement of the author that there is no real difference in the working of the sensible stimulation for narcotized, not narcotized or brainless animals, proves not to be exact in all cases.

But these results are also of importance with a view to the theoretical considerations of LABORDE and this is in fact what gave rise to this communication.

LABORDE passes the *N. glossopharyngeus* over in a few words, which prove, that he does not pay sufficient attention to what is known about this nerve. He says about it:

„Grace à un des résultats nouveaux de mes recherches personnelles ce nerf (c. a. s. *N. Laryngé supérieur*) n'est pas le seul qui puisse intervenir efficacement dans la réalisation fonctionnelle dont il s'agit.

Le nerf glossopharyngien considéré jusqu'à présent dans sa fonction essentielle comme un agent de sensibilité spéciale (sensibilité gustative), prend aussi une part réelle et active à titre de nerf sensitif de départ réflexe au fonctionnement respiratoire."

In 1883 KNOLL considered the N. Glossopharyngeus as belonging to those nerves which have always an inspiratory reflex-action on the respiration and several physiologists deny the gustative signification of the N. glossopharyngeus altogether or consider it at least of little importance.

For the action of the rhythmical tongue-tractions we have to think of three sensible nerves, viz.:

1. N. laryngeus superior.
2. N. glossopharyngeus.
3. Ram. lingualis N. trigemini.

The first is of little importance to our purpose because on account of the distribution of its branches, it has the smallest chance of being really stimulated in LABORDE's method. Moreover it gives regularly a suspension of expiration under my experiment-conditions, and the results arrived at by means of pure chloroform-narcosis have some more value in this case, because the method will find its most important application in the chloroform-asphyxia.

Yet it is not impossible that the N. laryng. sup. under certain conditions may restore the arrested respiration.

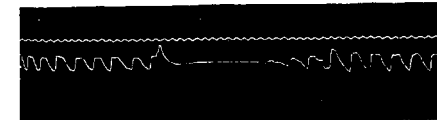
LABORDE brought about suffocation of his animals, by closing the air passages completely. The respiration curve changes its character completely, it begins to resemble a normal curve, held upside down. Instead of expiratory we get inspiratory positions of rest (see curve XVII). It is not easy to explain this phenomenon, as it would be more likely that the air-resorption in lungs where the air cannot enter, would give mechanically an expiratory position. The craving for air (comp. the subjoined curve XVI) does not explain it satisfactorily either, as a double pneumothorax gives long positions of rest in expiration, interrupted by energetical inspirations. The stimulation of the N. laryngeus superior gives an arrest, generally in a strongly pronounced expiratory position.

The fact is that the electric excitation of the N. laryngeus superior has an opposite effect, which favours expiratory positions and in connection with the forced inspirations may bring about rhythmical in- and expiration.

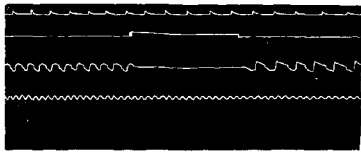
Therefore it does not seem probable to me, that on account of the experiment of LABORDE, about which no sufficient information



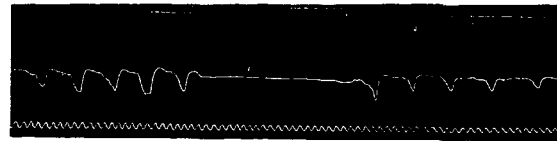
I Arrest in expiration by mechanical excitation of the N. sympathicus during 65 seconds. The asterisks indicate the beginning and the end of the excitation.



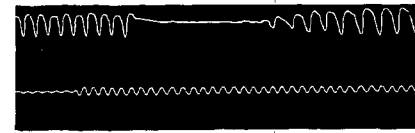
II Electrical excitation of the N. splanchnicus.



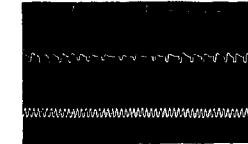
III Excitation of the N. vago-sympathicus.



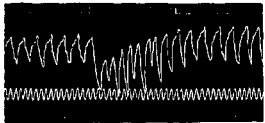
IV Electrical excitation of the N. vagus.



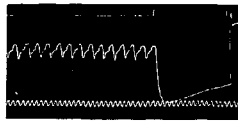
V Electrical excitation of the N. laryng. superior.



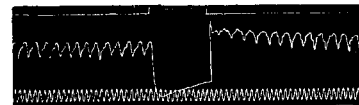
VI Excitation of the fila olfactoria.



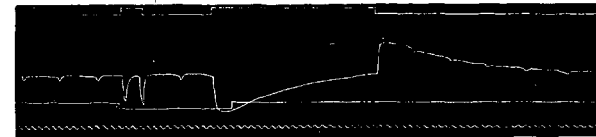
VII Excitation of the N. glossopharyngus.



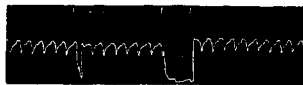
VIII Electrical excitation of the N. glossopharyngus.



IX Electrical excitation of the N. glossopharyngus.



X Electrical excitation of the N. glossopharyngus.



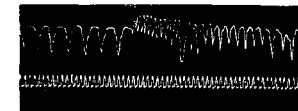
XI Excitation of the N. glossopharyngus.



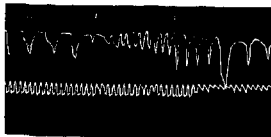
XII Excitation of the fila olfactoria.



XIII Excitation of the Ram. lingualis.



XIV Excitation of the N. lingualis.



XV Excitation of the N. lingualis.



XVI Respiration with double pneumothorax.



XVII Respiration with perfect closure of the air-passages.

is to be had, we may hold the N. laryng. sup. answerable for the usual action of the method, as it will most likely never be applied except for experiments on animals, when complete closure of the air passages has brought about cessation of respiration. For it is exactly the experimental closure which modifies the usual type of respiration greatly, and which introduces unknown factors in the mechanism of respiration.

It is quite a different thing for the N. glossopharyngeus and the ram. ling. N. V. They must necessarily be stimulated by every traction of the tongue. The N. glossopharyngeus appears to have an exceedingly strong effect on the inspiration, an arrest with strong stimulations, an acceleration with weaker stimulations. As well according to the investigations of KNOLL of 1883, as to my investigations in Prof. WINKLER's laboratory, and to LABORDE's vague allusion, the 9<sup>th</sup> nerve of the brain has this strong reflex-action. It is therefore not very rational, not to look first of all to this nerve, in trying to find the explanation of the respiratory mechanism in LABORDE's method.

The excitation of the N. trigeminus may also produce inspiratory effects under the experimental conditions introduced by KNOLL (unknown to me); a pure chloroformnarcosis however, cannot have any or but a very small effect.

**Chemistry.** — "*Echinopsine, a new crystalline vegetable base*".  
By Dr. M. GRESHOFF (Communicated by Prof. A. P. N. FRANCHIMONT).

(Will be published in the Proceedings of the next meeting).

**Chemics.** — "*The constitution of the Vapour-phase in the System Water-Phenol, with one or two Liquid-phases.*" By Dr. F. A. H. SCHREINEMAKERS (Communicated by Prof. J. M. VAN BEMMELEN).

(Will be published in the Proceedings of the next meeting.)

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(June 20, 1900.)