

SOME NEW ASPECTS OF THE RESORPTION ABILITY OF THE NASAL MUCOSA

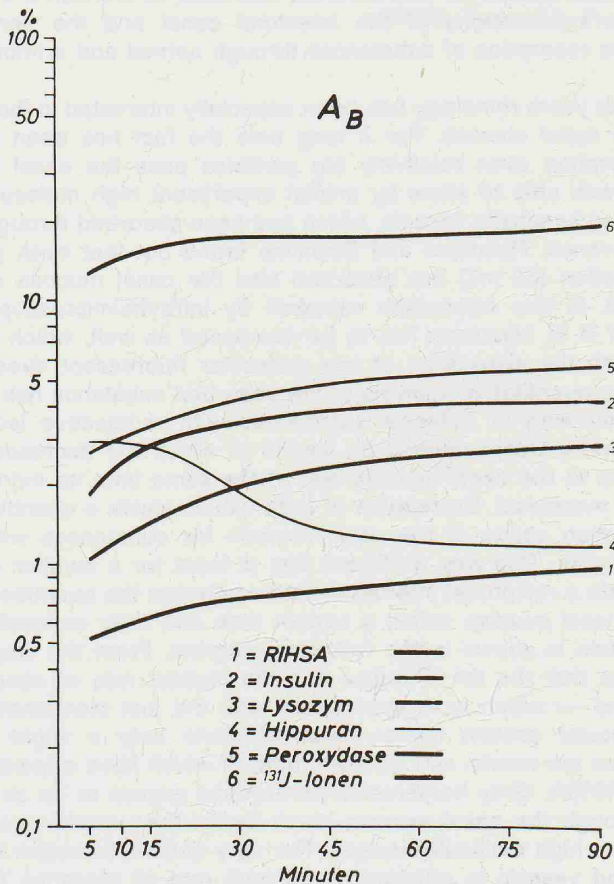
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The problem of the absorption of foreign substances into the organism has been a subject of scientific research for some time and has been pursued by several branches of science with different methods. To mention are the gastro-
-enterological examinations of the intestinal canal and the dermatological findings of the resorption of substances through normal and artificially altered skin.

During the last years rhinology has been especially interested in the absorption ability of the nasal mucosa. For a long time the fact has been known that through absorption even relatively big particles pass the nasal mucosa. In 1938 Yoffey was able to show by animal experiment high molecular albumin in the removing lymphatic vessels, which had been absorbed through the nasal mucosa. Chevance, Naumann and Strömme found out that even particles as big as rye pollen (30 mü) are absorbed into the nasal mucosa of the sensitized animal. In this connection research by intravitalmicroscopical animal experiment of H. H. Naumann has to be mentioned as well, which was mainly concerned with the absorption of low molecular fluorescent dyes.

Only lately the quantitative analysis of the absorbed substance has been made possible by marking of different substances with radioactive isotopes. We have developed a tracer method by means of which the decrease of a substance applied to the nasal mucosa and at the same time its increase in the blood can be measured. Correlation of both values yields a quantitative result of the absorption ability of the nasal mucosa for substances with different molecular weights. This way we found that at least for a number of substances there exists a reciprocal interdependence between the quantities absorbed through the nasal mucosa within a certain time and their molecular weights. This observation is shown in the following diagram. From the diagram it becomes evident that the ion 131 iodine has the highest rate of absorption. On the other hand — which is in accordance with the just mentioned — shows the highmolecular protein human-serum-albumine only a slight absorption rate; inbetween are insulin and lysozym, both of which have a lower molecular weight than RIHSA. Only horseradish-peroxydase proves to be an exception: it passes through the nasal mucosa much better than would have been expected from its high molecular weight. The very quick elimination of hippuran from the blood vessels is effected by its high rate of secretion through the kidneys. Its increase in the blood within the first five minutes allows nevertheless the conclusion that hippuran is absorbed only slightly less than the 131 iodine ion itself, which was to be expected from its low molecular weight.

Subject of all these experiments was the normal nasal mucosa of the rabbit. The clinically interesting question, whether there is a change in resorption in case of pharmacological altered mucosa, was put into the foreground of our following series of experiments. These are supposed to be an extension of the experiments conducted by Tonndorf and assistants and by Boric, who applied hyoscamine respectively pilocarpine and gained an insight into the resorption ability of the human nasal mucosa through the pharmacological effect of these substances. We aimed at a quantitative analysis of the change of resorption of a pharmacological indifferent substance under the influence of well known vaso-active pharmaca. As testing substance we chose iodine in the form of sodium-iodide in aqueous solution, as we knew its rate of resorption from other experiments. As vaso-active pharmaca we used naphazoline, nicotinicacidamide and hyoscyamine. All these substances effect a retardation of the resorption of iodidions as the

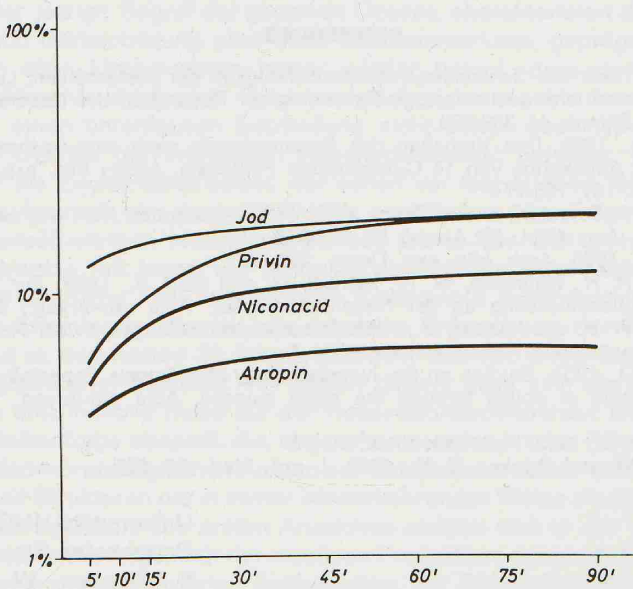


Synoptische Darstellung des Aktivitätsanstieges im Blut

following slide shows. It is of interest that the retardation through naphazoline is significant only within the first few minutes after application, at the end of the experiment there is the same rate of absorption with and without naphazoline. Naphazoline was applied locally on the nasal mucosa before commencing the experiment. As a subordinate result of intravitalmicroscopical observations we found that the ciliary activity is not influenced by naphazoline. When infusing the vasodilatator nicotinicacidamide in a dose of 100 mg/kg body weight we could, however, observe a depression of the absorption rate of 1/3. Even more distinctive was the absorption retardation of ¹³¹iodine ion in aqueous solution after a preceding intravenous application of hyoscyamine in a dose, physiological for rabbits, of 0.5 mg/kg body weight. The absorption rate was reduced by 2/3, as can be seen on the diagram.

The results after application of naphazoline are in accordance with results that were compassed in a modified manner with other vaso-contractive pharmaca as ephedrine and adrenalin at different mucous membranes. The distinctive retardation of absorption through the nasal mucosa, however, when applying nicotinicacidamide and hyoscyamine is surprising. For both pharmaca effect — as we could see by microscopical experiment — among other things a vaso-dilatation of the capillary system of the nasal mucosa. Experiments as those at hyperhaemized skin showed up to now that under these conditions the absorption of foreign substances is significantly increased. The difference between the just mentioned experiments and ours lies perhaps in the fact that this kind of hyperhaemia is a by-product of an artificially generated infection. Connected with it is always a superficial alteration of the epithelium. As such an alteration of the superficial mucosa epithelium was not the case

Veränderung der Resorption durch die Nasenschleimhaut bei verschiedenen Pharmaka



in our experiments, we came to the conclusion that a pharmacological generated hyperhaemia of the capillary system of the nasal mucosa without alteration of the epithelium does not increase the absorption of foreign substances. Factors as the alteration of the haemodynamic in the capillary system on dilatation of the vessels or the change of pH and of the viscosity of the nasal mucous are probably of decisive relevance for the in our experiments even decreased rate of absorption. We could not observe a stagnation or a retardation of the ciliary activity under the influence of hyoscyamine or nicotinicacidamide when conducting experiments with living animals.

SUMMARY

Some new results in the research of the resorption ability of the nasal mucosa have been gained by radioisotopical methods. The reported experiments show, that the molecular weight of a substance is an important factor for its resorption through the nasal mucosa into the organism. Furthermore it can be stated, that the unchanged, physiological nasal mucosa has the best resorptionability. A change of the physiological condition of the mucosa reduces its resorption ability. This could be seen when applying different pharmaca.

RÉSUMÉ

On rapporte quelques nouvelles observations sur les capacités de résorption de la muqueuse nasale étudiées avec les radioisotopes.

Selon notre expérience, le poids moléculaire d'une substance joue un rôle important dans la résorption de la muqueuse nasale. Par ailleurs on note que la muqueuse normale a une meilleure capacité de résorption.

Les modifications des conditions physiologiques réalisées par l'application de différents médicaments diminuent la quantité de résorption d'une substance.

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