

# Quantitative measurements of radioactive isotopes in human nasal secretion

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## SUMMARY

*Four patients receiving an intravenous injection of  $^{99m}\text{Tc}$ -pertechnetate were investigated concerning transfer of the radioisotope to the nasal secretion. The concentration of isotope in nasal secretion was in all patients found to be approximately 10 times higher than in blood. The results suggest an active transport mechanism in the glandular elements of the nasal mucosa and that they are important as source of nasal secretion during normal conditions.*

## INTRODUCTION

At present little is known about the production of nasal secretion. The mucous is a mixture of secretory products from the epithelial lining, the submucous glands and also a mixture of transudation, tears, loose cells, microorganisms (Mygind, 1978). Biochemical analyses reveal the presence of a large variety of chemical substances. The glukoproteins are important in forming the mucous (Melon and Schoffeniels, 1966).

The main source of nasal secretion is probably the goblet cells and submucous glands. (Ingelstedt and Ivstam, 1949). They have active transport mechanisms to form the characteristic mucous. This means that for example proteins that normally does not pass the epithelial lining can be secreted. During pathological conditions a transudation may occur (Jackson and Burson, 1977). The role of transudation in a normal condition is not known but is assumed to be small.

Our own investigation has been done with radioisotopes in order to study the sources of nasal secretion.

## PRELIMINARY TRIALS

In the first series of experiments four different radioactive isotopes were investigated concerning transfer to the nasal secretion. The radioisotopes were injected intravenously.  $^{99m}\text{Tc}$ -pertechnetate with a molecular weight of 186 was found to

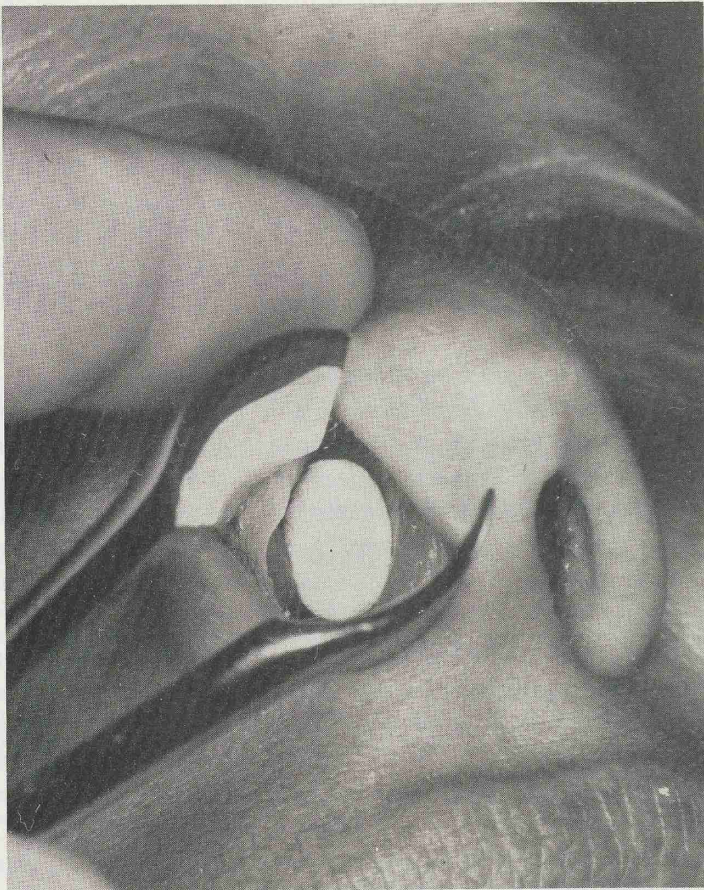


Figure 1. Collection of samples of nasal secretion. The porous disc is placed on the nasal septum approximately 1.5 cm from its caudal end.

pass over to the nasal secretion. Tallium did not pass to the nasal secretion and neither did Tc-MDP. Concerning albumin labeled by Tc, radioactivity was found in nasal secretion but this might be due to poor attachment of Tc to the protein.  $^{99m}\text{Tc}$ -pertechnetate was elected for further study.

#### MATERIAL AND METHODS

The nasal secretion of the radioisotope Tc was studied in four patients, who for other reasons were examined scintigraphically. The age distribution was 30–82 years, three women and one man. Each patient received an intravenous injection of 300 MBq,  $^{99m}\text{Tc}$ -pertechnetate. A small preweighed porous disc (Millipore) was placed on the nasal septum for a time of five minutes. (Figure 1). The nasal opening was blocked by a tape preventing respiration through the actual nasal

cavity. During this period a disc of the same type was soaked with a couple of blood drops taken by intravenous route. Samples were taken with a 15 minutes interval during three hours. Both discs were reweighed and the radio-isotope was measured in a gamma well counter. The radioactivity in nasal secretion and blood was expressed in cpm per gram. For convenience of sampling, the concentration of radioisotope in whole blood was used as a reference since serum values were only slightly higher and followed blood values closely.

### RESULT

The concentration of the radioactive isotope in blood showed a quick initial increase and then as a result of the elimination and to some extent decay of the isotope a slow decrease. (Figure 2). The concentration of radioisotope in nasal secretion was in all patients found to be about 10 times higher than in blood. The same result was obtained from the mean values of the four patients. During the registration period of three hours the concentration of radioisotope in nasal secretion also showed a slight decrease similar to blood values.

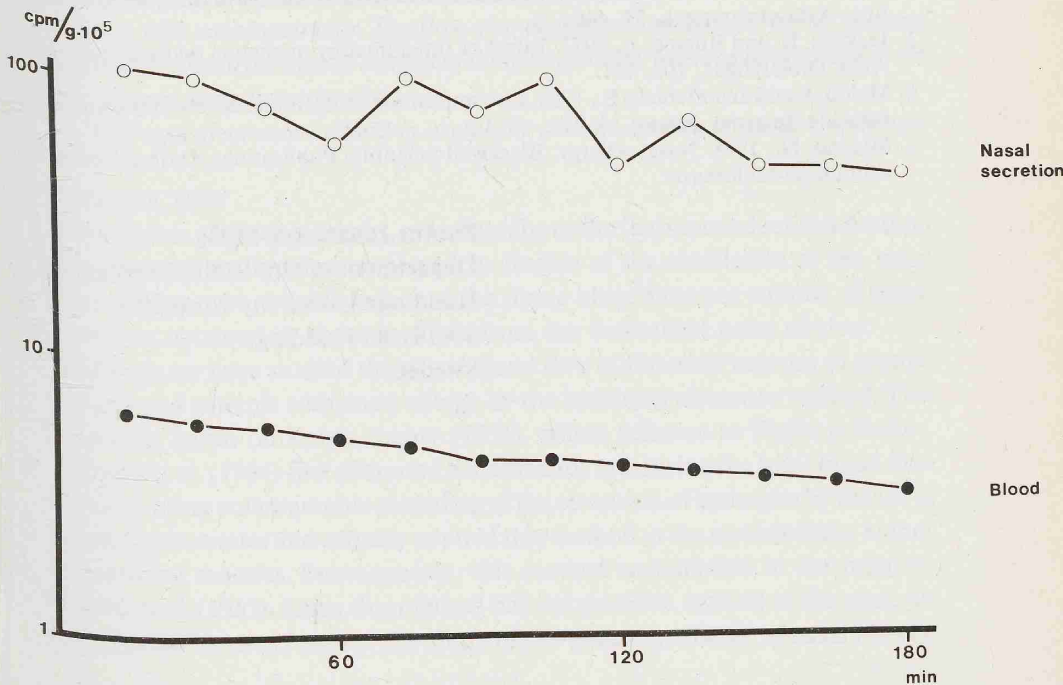


Figure 2. The concentration of  $^{99m}\text{Tc}$ -pertechnetate in nasal secretion and blood is expressed in cpm per gram  $\times 10^5$ . Mean values from the four patients examined.

## CONCLUSION

The concentration of  $^{99m}\text{Tc}$ -pertechnetate in nasal secretion was approximately 10 times higher than in blood. The result suggests that Tc is transported across the nasal mucosa by an active transport mechanism from the goblet cells, the sub-mucous glands or both. This indicates that glandular elements are very important as the source of nasal secretion during normal conditions. However, methodological errors may influence the results and will be further evaluated.

## ZUSAMMENFASSUNG

Vier Patienten, die  $^{99m}\text{Tc}$ -pertechnetat intravenös erhielten, wurden betreffend Passage vom Radioisotop ins Nasensekret untersucht. Man fand bei allen Patienten, dass die Konzentration im Nasensekret etwa zehn mal höher als im Blut war. Dieses Ergebnis deutet darauf hin, dass ein aktive Transportmechanismus in den Drüsen der Nasenschleimhaut besteht; und dass diese unter normale Bedürfnisse auch eine wichtige Quelle der Nasensekretion sind.

## REFERENCES

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