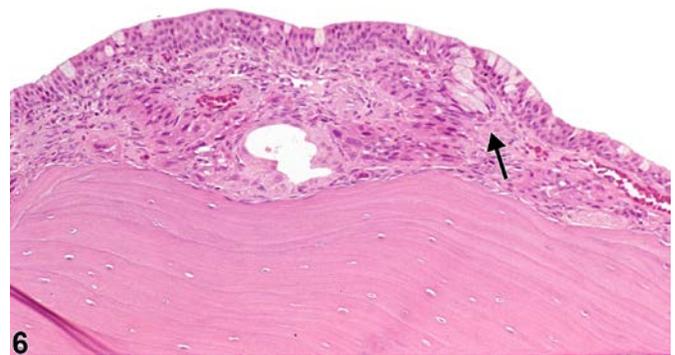
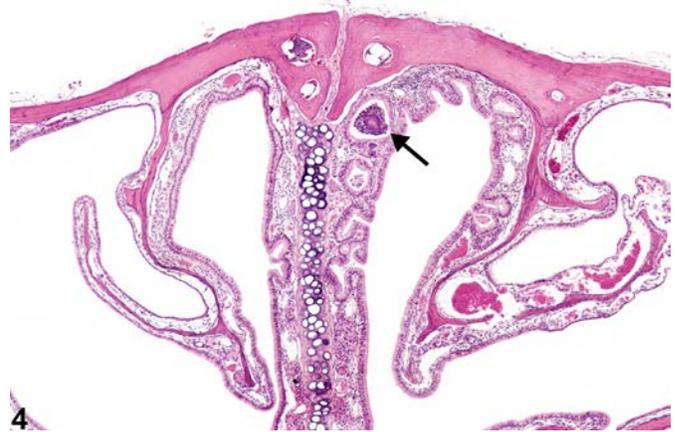
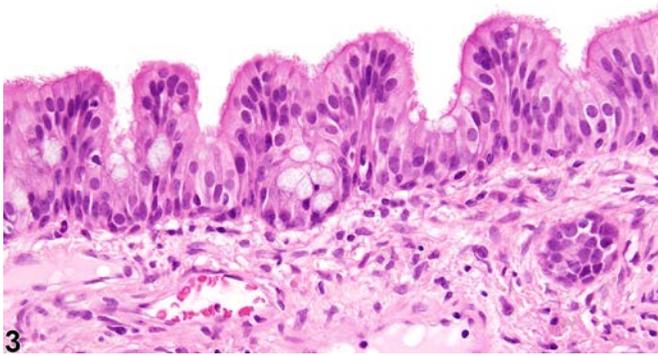
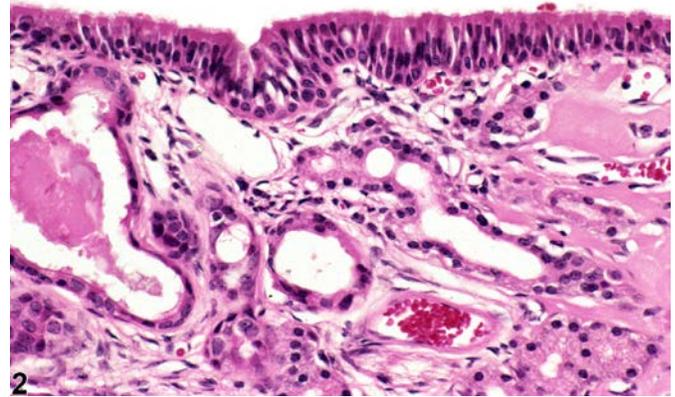
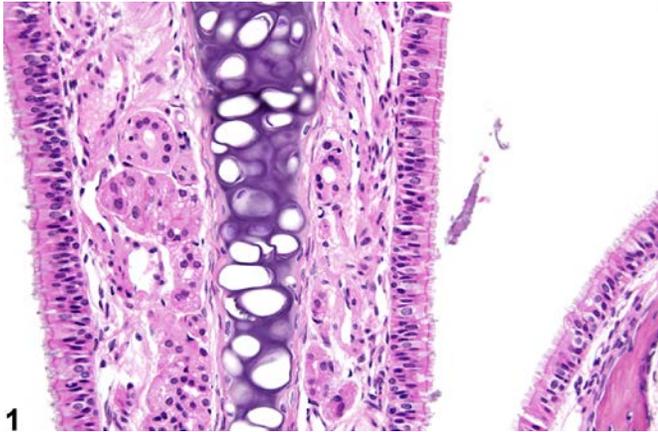
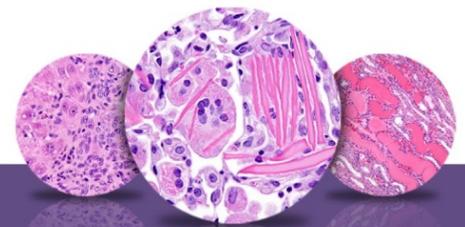




NTP Nonneoplastic Lesion Atlas

Nose, Epithelium – Hyperplasia





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Nose, Epithelium – Hyperplasia

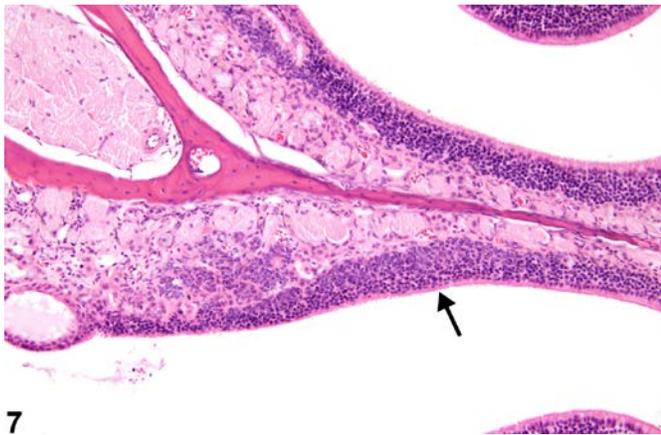


Figure Legend: **Figure 1** Nose, Respiratory epithelium - Normal in a male B6C3F1/N mouse from a subchronic study. The normal respiratory epithelium on the nasal septum is presented for comparison with Figures 2-7. **Figure 2** Nose, Respiratory epithelium - Hyperplasia in a female B6C3F1/N mouse from a chronic study. Minimal thickening and folding of the surface epithelium is present, with some nuclear crowding and pleomorphism. **Figure 3** Nose, Respiratory epithelium - Hyperplasia in a female Harlan Sprague-Dawley rat from a chronic study. The thickened proliferative epithelial surface is arranged in regular folds. **Figure 4** Nose, Respiratory epithelium - Hyperplasia in a male B6C3F1/N mouse from a chronic study. Proliferation of the epithelial cells resulted in thickening of the epithelium, with folding and invagination into the lamina propria forming pseudoglands. A concretion (arrow) is present within one of the pseudoglands. **Figure 5** Nose, Respiratory epithelium - Hyperplasia in a male B6C3F1/N mouse from a chronic study (higher magnification of Figure 4). Infolding or invagination of the hyperplastic epithelium forms pseudoglands. A concretion is present within a pseudogland (arrow). **Figure 6** Nose, Transitional epithelium - Hyperplasia in a male F344/N rat from a chronic study. Numbers of superficial epithelial cells are increased, and a focal downgrowth of basal epithelial cells extends into the lamina propria (arrow). Goblet cells are also increased, which may be better termed “goblet cell metaplasia.” **Figure 7** Nose, Olfactory epithelium - Hyperplasia in a male B6C3F1/N mouse from a chronic study. There is proliferative thickening of the olfactory epithelial mucosa (arrow).

Comment: Transitional or respiratory epithelial hyperplasia is a relatively common treatment-related change and can also be seen in inflammatory lesions caused by foreign bodies and infectious agents. Hyperplasia is an increase in the number of cells and should not be confused with regeneration, which



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is replacement of lost or damaged cells. Hyperplasia results in thickening of the epithelium (Figure 2, Figure 3, and Figure 6) and may result in cellular crowding that forces the epithelium into folds (Figure 2 and Figure 3). However, the mucosal surface of the caudoventral nasoturbinate is normally folded; this should not be interpreted as respiratory epithelial hyperplasia. Mucosal invaginations of hyperplastic epithelium (Figure 4 and Figure 5) may extend into the lamina propria and may contain some inflammatory cells or concretions. Invagination of hyperplastic epithelium is thought to occur with prolonged hyperplasia. Goblet cell proliferation (Figure 6) is a common response of the epithelium and is often seen concurrently with hyperplasia. Hyperplasia of the olfactory epithelium typically results in thickening of the epithelial layer (Figure 7).

Recommendation: Hyperplasia of the transitional or respiratory epithelium should be diagnosed whenever present and assigned a severity grade. The site listed in the diagnosis should reflect the epithelial cell type affected. If a particular cell type can be identified as the proliferating cell (e.g., basal cell or goblet cell), that cell type should be included as a modifier. Since these cells are proliferating, they are often slightly larger (hypertrophy) than nonproliferating respiratory epithelial cells. Hypertrophy should be diagnosed separately only if the pathologist is confident that the enlargement is beyond that expected for proliferating cells. If the epithelial cells appear to be abnormal (e.g., cellular or nuclear pleomorphism, anaplasia, or enlargement) or there is an abnormal or aberrant growth pattern (e.g., disorganization of the cells, dyskeratosis, or increased or abnormal mitotic figures), the term “atypical” should be added as a diagnostic modifier (see *Nose, Epithelium – Hyperplasia, Atypical*). Regenerating epithelial cells may have some irregularity in their cytologic features and arrangement; care must be taken not to mistake this for atypical hyperplasia.

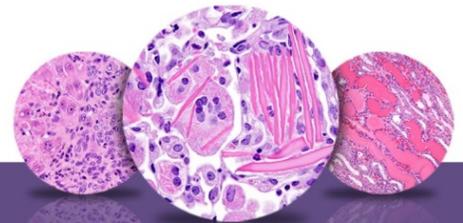
References:

Boorman GA, Morgan KT, Uraih LC. 1990. Nose, larynx, and trachea. In: *Pathology of the Fischer Rat: Reference and Atlas* (Boorman GA, Eustis SL, Elwell MR, eds). Academic Press, San Diego, 315–337.

Brown HR, Monticello TM, Maronpot RR, Randall HW, Hotchkiss JR, Morgan KT. 1991. Proliferative and neoplastic lesions in the rodent nasal cavity. *Toxicol Pathol* 19(4, pt 1):358-372.

Abstract: <http://www.ncbi.nlm.nih.gov/pubmed/1813982>

Herbert RA, Leninger JR. 1999. Nose, larynx, and trachea. In: *Pathology of the Mouse: Reference and Atlas* (Maronpot RR, ed). Cache River Press, Vienna, IL, 259-292.



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References:

Monticello TM, Morgan KT, Uraih LC. 1990. Nonneoplastic nasal lesions in rats and mice. *Environ Health Perspect* 85:249-274.

Full Text: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1568333/>

National Toxicology Program. 1990. NTP TR-376. Toxicology and Carcinogenesis Studies of Allyl Glycidyl Ether (CAS No. 106-92-3) in Osborne-Mendel Rats and B6C3F1 Mice (Inhalation Studies). NTP, Research Triangle Park, NC.

Abstract: <http://ntp.niehs.nih.gov/go/8892>

National Toxicology Program. 1992. NTP TR-410. Toxicology and Carcinogenesis Studies of Naphthalene (CAS No. 91-20-3) in B6C3F1 Mice (Inhalation Studies). NTP, Research Triangle Park, NC.

Abstract: <http://ntp.niehs.nih.gov/go/7700>

National Toxicology Program. 1994. NTP TR-440. Toxicology and Carcinogenesis Studies of Ozone (CAS No. 10028-15-6) and Ozone/NNK (CAS No. 10028-15-6/ 64091-91-4) in F344/N Rats and B6C3F1 Mice (Inhalation Studies). NTP, Research Triangle Park, NC.

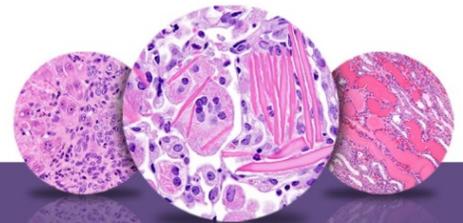
Abstract: <http://ntp.niehs.nih.gov/go/6024>

National Toxicology Program. 2006. NTP TR-526. Toxicology and Carcinogenesis Studies of a Mixture of 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD) (CAS No. 1746-01-6), 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) (CAS No. 57117-31-4), and 3,3',4,4',5-Pentachlorobiphenyl (PCB 126) (CAS No. 57465-28-8) in Female Harlan Sprague-Dawley Rats (Gavage Studies). NTP, Research Triangle Park, NC.

Abstract: <http://ntp.niehs.nih.gov/go/9307>

Renne R, Brix A, Harkema J, Kittel B, Lewis D, March T, Nagano K, Pino M, Rittinghausen S, Rosenbruch M, Tellier P, Wohrmann T. 2009. Proliferative and nonproliferative lesions of the rat and mouse respiratory tract. *Toxicol Pathol* 37(7 suppl):5S-73S.

Abstract: <http://www.ncbi.nlm.nih.gov/pubmed/20032296>



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