

TWO NEW RECORDS OF THE SPECIES OF THE GENUS *TRICHURIS* FROM INDIAN RUMINANTS

In the paper are recorded, *Trichuris parvispiculum* from goats and sheep and *Trichuris discolor* from cattle and buffaloes. *T. parvispiculum* is previously known from goats in South Africa Ortlepp (1937) while *T. discolor* was originally described by V. Linstow (1906) from Ceylon. *T. parvispiculum* is a very common parasite of sheep and goats in the Punjab and United Provinces and was collected from Sialkot, Lahore, Multan, Delhi, Mukteswar-Kumaon and Izatnagar. *T. discolor* is on the hand rare and has been collected only from five cases out of fifty so far examined. Those were collected twice from Mukteswar, once from Izatnagar and twice from Sialkot. Examination of faeces of calves at Izatnagar showed that calves of about 1½ years of age always harboured trichurids. It has previously been reported by the author (paper in press) that *Trichuris globulosa* is a very common parasite of sheep and goats and occurs along with *T. parvispiculum*. The cattle slaughtered in localities where this parasite occurs, do not harbour *T. globulosa* though it has been reported from these animals from other countries.

Description of *T. parvispiculum* is not given in the paper as the material tallies in all essentials with that of the original author. A character not mentioned by him is that there are

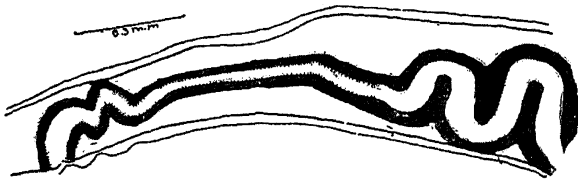


FIG. 1. *T. discolor*; Vagina

cuticular vesicles on the anterior part of the species. Presence of cuticular vesicles has been mentioned by Hall (1910), Solomon (1932) and Baylis (1935) in the species *T. leporis*, *T. spiricollis* and *T. mettami* respectively.

Host: *Capra hircus* and *Ovis aries*.

Location: Cæcum.

Locality: Indicated in the text.

It is not the intention of the author to dwell of characters already described by V. Linstow and hence only characters not previously described and considered useful in the proper identification of the species are included. The description is based on thirty individuals.

Male: Internal genitalia. Vas deferens measures from 2.4-3.15 mm. and ejaculatory duct 8.6-10.2 mm. long. The muscular constriction which joins the two parts is about 0.27×0.18 mm. Cloaca varies 1.55-1.7 mm. in length with the spicular tube joining it 0.55-0.85 from the posterior end. The ejaculatory duct pursues a somewhat wavy course for some distance from its start and is approximately about three times the size of vas deferens and seven times the size of cloaca.

Testis starts in the region of cloaca, is straight in about one-third of the ejaculatory region, becoming moderately convoluted thereafter while in the region of vas deferens it is beaded.

There are vesicular swellings on the anterior end and cuticular vesicles and plaques at some distance from the anterior end. There is a conical papilla on either side of the posterior end.

Female: Vagina after about two proximal curves is straight for some distance and is again followed by a few curves before joining the uterus. The diameter of the straight middle part is even throughout, is less than that of the proximal curves and is at the same time less muscular.

Host: *Bos indicus* and *Bos bubalis*.

Location: Cæcum.

Locality: Mukteswar-Kumaon, Izatnagar, U.P., Sialkot (Punjab).

Military Dehydrated Meat Factory,

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STUDIES ON THE CATALYTIC FORMATION OF DI-OLEFINS FROM MONO-OLEFINS

(a) Chemical Equilibrium in Butadiene-1,3 Formation from Butene-1 at Low Pressures

IN view of the difficulties involved in the determination of chemical equilibrium in the dehydrogenation of butene-1 to butadiene-1,3, at atmospheric pressure, even in the presence of a highly active catalyst such as Cr_2O_3 - Al_2O_3 , an apparatus has been specially devised to study the reaction at the lower pressures of 10-50 mm. of mercury and in the temperature range of 360-540°C. The reaction has been studied in detail over the following three catalysts:

(1) Cr_2O_3 - Al_2O_3 (5 per cent.); (2) Cr_2O_3 - Al_2O_3 (5 per cent.)- V_2O_5 (2.5 per cent.)- Mo_2O_3 (2.5 per cent.); (3) Cr_2O_3 - Al_2O_3 (5 per cent.)-Cu (10 per cent.), of which the catalyst No. (3) promoted by copper has been found most efficient. The equilibrium constant of the reaction has been calculated from the equation,

$$K_p = \frac{Px^2}{(1-x^2)}$$

where x is the degree of dissociation of butene-1 and P is the total pressure in atmosphere. From the value of K_p , free energy of the reaction has been evaluated by using the relation, $\Delta F_T = -RT \ln K_p$. The following

values of K_p and ΔF_T for reactions at five different temperatures have been obtained (Table I).

TABLE I

Temperature °C.	K_p	ΔF_T (Calories)
370	0.000244	10,620
410	0.000823	9,642
440	0.002080	8,748
470	0.004703	7,911
500	0.008668	7,294

From the above values of K_p , the following mean value of the heat of reaction (temperature range 370-500°C.) is obtained:

$$\Delta H_T = 28,600 \text{ calories.}$$

The free energy as a linear function of temperature is expressed by the equation: $\Delta F_T = 29,352 - 28.58 T$. The temperature of neutral equilibrium is: $T_0 = 744^\circ \text{C}$.

TABLE II

Temperature °C.	K_p	ΔF_T (Calories)
330	0.000,261	9,880
370	0.001,020	8,800
410	0.003,752	7,580
450	0.011,100	6,465

(c) Heat of Reaction, Free Energy of Reaction and Entropy in the Dehydrogenation Equilibrium of Paraffin-Olefin Isomers-Diolefin of the Isopentane and n-Butane Series

Employing the results obtained from the study of dehydrogenation equilibrium of the two very important olefins, butene-1 and 3-methyl-butene-1 to the corresponding diolefins, butadiene 1,3 and isoprene in conjunction with the accurate data on the heats of formation obtained by Rossini,¹ heats of hydrogenation obtained by Kistiakowsky,² entropy

TABLE III

Reactions	Equations for standard Free energies of the reactions	ΔH°_{298} cal	ΔF°_{298} cal.	ΔS°_{298} E.U.	$T^\circ \text{C}$.
n -Butane \rightleftharpoons Butene-1 + H_2	$\Delta F_T = 28,252 + X^* + 12.21T$	30,098	20,442	32.4	656
n -Butane \rightleftharpoons <i>cis</i> Butene-2 + H_2	$\Delta F_T = 26,481 + X + 14.01T$	28,327	19,207	30.6	653
n -Butane \rightleftharpoons <i>trans</i> Butene-2 + H_2	$\Delta F_T = 25,531 + X + 14.6T$	27,377	18,437	30.0	640
Butene-1 \rightleftharpoons Butadiene-1,3 + H_2	$\Delta F_T = 25,496 + X + 20.03T$	27,342	20,015	24.6	744
<i>Cis</i> Butene-2 \rightleftharpoons Butadiene-1,3 + H_2	$\Delta F_T = 27,267 + X + 18.25T$	29,113	21,255	26.5	
<i>Trans</i> Butene-2 \rightleftharpoons Butadiene-1,3 + H_2	$\Delta F_T = 28,259 + X + 17.5T$	30,105	22,025	27.1	
Isopentane \rightleftharpoons 3-Methyl-Butene-1 + H_2	$\Delta F_T = 28,247 + X + 15.12T$	30,093	21,303	29.5	743
Isopentane \rightleftharpoons 2-Methyl-Butene-1 + H_2	$\Delta F_T = 26,401 + X + 15.12T$	28,247	19,457	29.5	685
Isopentane \rightleftharpoons 2-Methyl-Butene-2 + H_2	$\Delta F_T = 24,830 + X + 16.91T$	26,676	18,422	27.7	690
3-Methyl-butene-1 \rightleftharpoons Isoprene + H_2	$\Delta F_T = 23,884 + X + 19.44T$	25,750	18,228	25.2	672
2-Methyl-butene-1 \rightleftharpoons Isoprene + H_2	$\Delta F_T = 25,750 + X + 19.37T$	27,596	20,074	25.2	
2-Methyl-butene-2 \rightleftharpoons Isoprene + H_2	$\Delta F_T = 27,321 + X + 17.53T$	29,167	21,095	27.1	

$$* X = -6.86T \ln T + 0.0023T^2 - 10^{-7}T^3.$$

(b) Chemical Equilibrium in Isoprene Formation from 3-Methylbutene-1 at Low Pressures

Chemical equilibrium in the dehydrogenation of 3-methyl-butene-1 to Isoprene has been studied at pressures of 10 to 35 mm. of mercury and in the temperature range of 330-450°C., over Cr_2O_3 - Al_2O_3 - V_2O_5 - Mo_2O_3 as catalyst. To maintain the activity of the catalyst steady, it was periodically activated by treatment with hydrogen at 550-575°C. From the values of K_p , the following thermodynamic characteristics of the reaction have been obtained (Table II).

The mean value of the heat of reaction: $\Delta H_T = 27,120$ calories. Free energy as a linear function of temperature: $\Delta F = 27,570 - 27.19 T$.

Temperature of neutral equilibrium:

$$T_0 = 671.5^\circ \text{C.}$$

and free energy functions calculated by Pitzer³ by statistical method and specific heat data given by Beeck⁴ the various thermodynamic functions involved in the dehydrogenation equilibrium of Paraffin-Olefinisomers-Diolefin of the n -Butane and Isopentane series have been calculated. A summary of the more important derivations are given in Table III.

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